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The Distribution of Real Estate Value Changes: Measurement and Implications, Metropolitan Boston 1870-1970

by Matthew Edel and Elliott Sclar
with Appendix by Barbara Sproat

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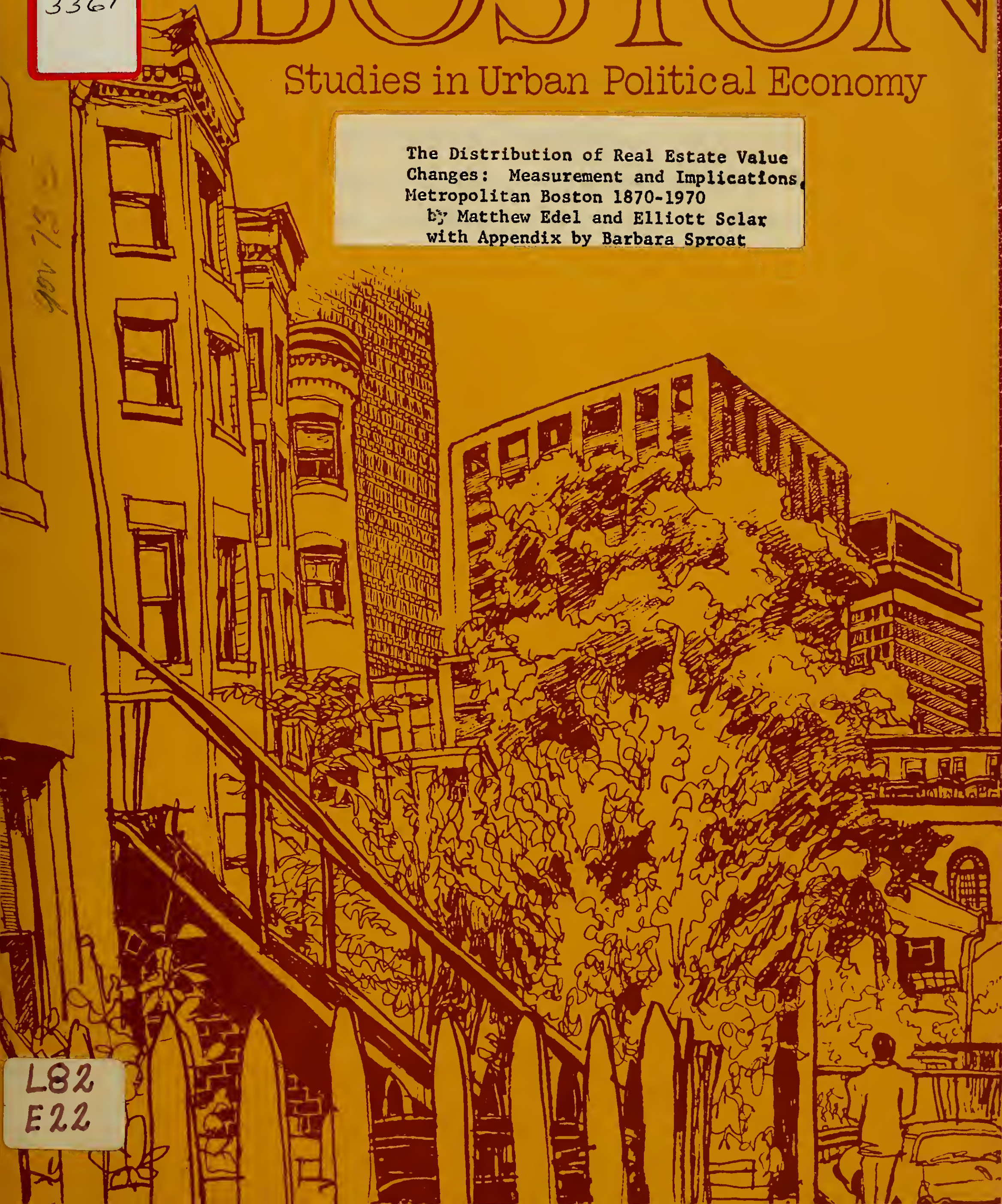

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I. Introduction

A substantial portion of the measured value of the stock of wealth in America is in the form of real estate. Furthermore, of all the forms in which wealth can be held (stocks, bonds, etc.,) real estate holdings represent the most widely distributed assets. More than 70 percent of all corporate stocks are owned by less than 1% of all wealth holders. Over 90 percent of corporate bonds and 100 percent of state and local governmental bonds are owned by fewer than 20 percent of wealth holders. In a sense then, the fact that the top 20 percent of wealth holders own "only" 52 percent of real estate and the top 2% only 29%, might seem to imply equality of distribution.[1] The portion of real estate which is not in business and industrial use but rather is residential is particularly widely held. Whereas England has been characterized as a "nation of shop keepers," perhaps the United States could be considered "a nation of homeowners." The importance of homeownership to the economic and political stability of the country has not only been a point of debate among theorists of the right and left; it is also enshrined as doctrine in that most sacred temples of the "non-ideological" center -- the U.S. tax code. While the costs of renting one's abode is not tax deductable, the costs of owning the same are partially deductible, thus making a solid economic incentive for this form of residential tenure part of articulated public policy.

Until a family's net wealth approaches a value of over $500,000, its home is a significant portion, accounting for at least 20%. In the range of wealth in which most families fall, those with less than $70,000, a home accounts for at least 40% of the total. (See Table I) Despite the important contribution of home ownership to the social and political stability of American society in general and urban society in particular, no empirical investigation of its performance as an investment has been undertaken comparable to studies of other investments.

TABLE I

PERCENTAGE OF WEALTHHOLDING IN THE FORM OF REAL ESTATE*

NET WORTH	PERCENTAGE OF TOTAL ASSETS IN FORM OF REAL ESTATE
Under $30,000	50%
$30,000 - $40,000	50
$40,000 - $50,000	48
$50,000 - $60,000	45
$60,000 - $70,000	40
$70,000 - $80,000	36
$80,000 - $90,000	37
$90,000 - $100,000	35
$100,000 - $120,000	33
$120,000 - $150,000	32
$150,000 - $200,000	27
$200,000 - $300,000	27
$300,000 - $500,000	20
$500,000 - $1,000,000	16
$1,000,000 - $2,000,000	10
$2,000,000 - $3,000,000	9
$3,000,000 - $5,000,000	9
$5,000,000 - $10,000,000	5
$10,000,000 and up	2

* Table derived from data presented in U.S. Department of the Treasury, Internal Revenue Service, Statistics of Income 1967: Individual Income Tax Returns, Washington: G.P.O., 1969.

This paper will not completely fill this gap. We will, however, suggest some of the directions in which the answer lies. We look specifically at the performance of land and house values in one metropolitan area during one century of urbanization. We will look at the behavior of these values in the various residential neighborhoods of that region in hopes of shedding some light upon the distribution of economic gains from participation in home ownership.

After a general introduction, this paper analyzes the pattern of real estate value change among the cities and towns which comprise the Boston metropolitan region in each ten year period from 1870 to 1970. The general conclusion is that within built-up areas, the increase in land or house values tended to be lowest at a shorter radius from the center of the City of Boston than in more suburban areas. To the extent possible with existing data, we attempt to draw out some social and political implications of that conclusion. The value change patterns indicate greater house-value appreciation was reaped by non-immigrant and higher-income communities than by immigrant and low income communities. They also indicated a sectoral pattern in which the Western suburbs tend to enjoy significantly greater land and house values than the Northern and Southern parts of the metropolitan area. But even in the most expensive and highest income of Western suburban areas, land value increments after subdivision did not constitute a substantial capital gain by comparison with nonhousing assets in most periods for which comparative data is available. Thus, rather than being an important force for increasing equality, home ownership tends to stabilize wealth disparities. The net effect of the observed land value changes is to change the wealth distribution only slightly and then in a regressive direction.

II. Home Ownership As An Investment

While traditional neoclassical models generally assume a single rate of interest and profit in equilibrium the notion that the return to home ownership is distinct from that to other investments is not new, although untested. At least since Frederick Engels wrote The Housing Question in 1872, there has been a stream of radical thought which has considered home ownership to be disadvantageous for workers -- a view shared at times by more conservative members of the banking fraternity. For Engels, the disadvantages lay in the inability of workers' savings to build housing on an advantageous scale and on the effect home ownership might have in chaining workers to disadvantageous jobs, including its inhibiting effect on labor militancy.[2] For the bankers, the inability of workers to meet debt service payments was the relevant consideration. Prodded from either left or right, various economists have considered the "soundness" of home ownership to the worker-resident as investor. Most, however, have compared the owner-occupied home with rental housing, as an alternative in providing shelter comparing inputed with cash rents. Their conclusions in favor of home ownership may merely reflect such institutional factors as the tax codes, monopoly elements in some rental housing markets and the exclusion of residents' unpaid maintenance labor from home ownership costs. They do not, however, generally compare housing with other investments.[3]

Apart from studies considering home ownership as a means of providing housing, other writings present it as a form of wealth holding which can give the poor an entry into participation in the benefits of capitalism. The recent Sabre Foundation study of Expanded Ownership, which classes homeownership along with "Black Capitalism" as an entry ticket into a broadened capitalist class is one of a long tradition of such proclamations.[4] These are backed up by the

standard economic definition of capital formation within the GNP accounts which classes homes as capital along with factories. In Marx's definition of capital, to be sure, owner occupied housing is not included: it does not represent investment made with the aim of employing labor for profit. An additional indication of the difference between housing and other capital investments is found in Marglin's econometric analysis of savings: he finds that, when housing is classed with consumption goods rather than investments, there is no net saving by households over the life cycle.[5] Net saving comes from the reinvestment of corporate earnings, corresponding to Marx's "self-expanding value." Yet, despite the opposition between the Marx-Marglin view that housing ownership and capital are qualitatively different kinds of investment, and the standard view that housing is simply capital, little empirical study is available of the differences between the two forms of investment, apart from occasional studies showing one is cyclical, the other countercyclical.

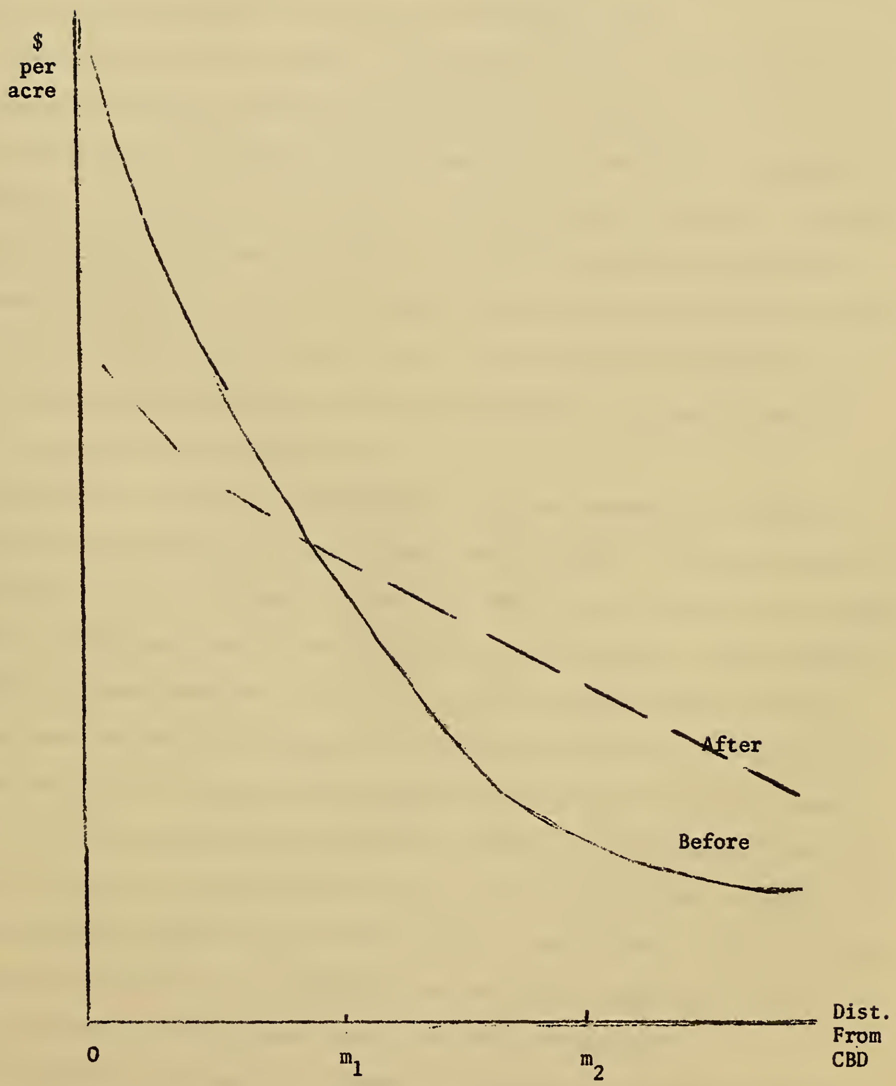
That residential housing may have lower returns, at least as measured by capital gains compared with other assets, is implicit in most extant models of the urban land market. These models give several reasons why the value of homes may be depressed over time compared to other assets. One reason lies in the so-called "filtering" process, by which used houses pass to lower income and status groups in the population, as new houses are built for those of higher income. In such a model, which seems to describe the American housing market at least in part, the construction of new housing is constantly providing a competitive pressure on the older housing stock, depressing its prices.[6] A second reason lies in the capitalization of local public service costs into housing value decreases when a property tax is used for their finance.[7] The third reason, and the one most clearly shown in economic models of the metropolis, lies in the effect

of new transportation modes and investments, which bring peripheral land into new competition with already developed areas of a city, and which, therefore, depress land prices in the latter while raising them in the new area.

A simplified graphic explanation, illustrative of several more complex models, can make this third reason clear.[8] If a city is imagined with jobs concentrated in a central business district, the differential advantages of equal-sized plots of land at different distances from that center would depend, at least in part, on differences in commuting cost to the center. The land prices generated by differential access, are shown in Figure I by the solid line which is a gradient indicating land values (or their annual rent equivalents) at different distances from the CBD. If, however, a transportation improvement occurs, so that the cost per mile of transport falls, this curve must become less steep, for each mile makes less real price difference. What is more, with more land coming within the feasible commuting range, the total availability of housing sites will put downward pressure on the average per-acre value of land unless more residents and business activity are drawn to the city to again increase demand. Therefore, if total urban population is constant, the Rent Gradient after the innovation will be shown by the broken line in Figure I. Comparing the two curves, one can see a proportionate increase in land values that is greatest at distance m_2 from the center, and which is negative at distances below m_1. In the typical North American city (although not necessarily in all cities), the land closer to the center of the city has often been held by lower income residents; thus the lower income owners of older homes may find their houses to have continually eroding values.

Even the owners who benefit from the rise in suburban land values may face similar losses in the future if further transport innovations occur.

FIGURE I



LAND VALUE GRADIENTS

Moreover, in practice, the suburban landowners may not be homeowners but rather land developers who will be able to sell for a capital gain to those residents who will later feel the price effects of new land, new housing and taxes.

These effects may well lead to a lowered real rate of capital gain on already-built residential housing than on alternative investments. Such a lowered return may be reconciled with the principles of neoclassical economics by invoking the principles that improper foreknowledge (here, of price declines), additional benefits (homeowner satisfaction) beside the capital gain, or risk averseness (accepting lower rates of return for the security of ownership) alter the conclusions of the perfect market model. But the distinction between homeownership gains and other investment yields has important consequences even if it can be reconciled with formal theory.

There are, of course, circumstances in which the ownership of housing or of house lots can yield greater than average capital gains. If the population or business activity of a city grows rapidly while the built-up radius does not expand sufficiently, then the value of existing houses can rise rapidly. This, however, has effects for home owners which are not the direct reverse of those occuring from land value declines or stagnation. In the latter case, sale of a home whose value has declined will leave an owner requiring new savings to acquire a newer house. In the former case of value increase, however, the opposite will not occur. Because the value of all houses will have risen, it will still require additional savings beyond the proceeds of the sale to acquire a newer house. Because a house is necessary for shelter, it is impossible for most owner-occupiers to realize the capital gains that occur and invest them in anything but housing.

A situation of inflated local demand is, naturally, advantageous for those persons with enough wealth to have invested in property beyond a single residence.

But even in these cases, the highest returns will likely not go to those with multiple older dwellings. Rather, there are likely to be a few opportunities for the conversion of non-urban land to urban land uses or in intensification of business land uses, which will yield very high returns. These opportunities may be limited, because of the need to coordinate public improvements, transport utilities and perhaps zoning regulations, and to maintain some minimum scale of operations. Such opportunities may, in some cases, be limited to a small group of well-connected developers; in some other cases they may be distributed among middle-sized investors by a sort of lottery by which chance or policy selects some speculative parcels for urbanization. The making of large fortunes in real estate is not infrequent, but it should not be confused with the appreciation of individual homes. The latter only can yield windfall capital gains sufficient to cover more than the cost of another house if specific land users require their specific parcels of land, and if means of limiting payment (such as eminent domain, urban renewal, or blockbusting) are not available.

These considerations suggest that there must be a wide diversity in returns to land ownership as well as that the returns to average residential properties may be low. Data available on the United States suggest that there has been unequal distribution of the total increment in land values that has taken place in the United States. To take an example from the popular press, the original purchase price of Manhattan comes to less than $1 per square mile. In 1852, midtown land sold at about $1 per square foot; in 1962 about $230/square foot.[9] This is a faster increase than on all U.S. land taken together. Joseph S. Keiper, et.al. estimate the total value of private non-institutional land in the United States in current prices as $95 billion in 1922, and about the same in 1938 (after a higher level in 1930 had been gained and re-lost), and then as $244 billion in

1956.[10] Goldsmith and Kendrick's estimates, part of a study of the national wealth of the U.S. as a whole, are $121 billion for 1945, $207-228 billion for 1956, and $344 billion for 1966.[11]

Manvel, in a study done for the National Commission on Urban Problems, gives higher estimates of 1956 value, and 1956-66 growth: he sees values as rising from $282 billion in 1956 to $549 billion in 1966.[12] Manvel estimates that between 1956 and 1966, the total value of urban property rose at a 6.5% annual rate compared with a 1.8% increase per year in consumer prices and a 6.2% annual increase in common stock prices. The pure land value of urban property rose 7.4% a year, while the structural value of all private taxable buildings in the U.S. rose only 5.6%. Average land value per property on non-farm 1-family house lots showed an even smaller increase every year 1956 to 1966; only 4.4%. The value of non-farm, 1-family housing apart from the land under it rose even less rapidly -- only 2.7%. These figures seem to indicate a lower capital gain to housing than to urban land in general or to stocks, whose prices rose 6.2% a year in this period, although the increase is greater than that in consumer prices (1.8%).[13]

But these figures are too global to be useful. They ignore changes in the urbanized area and in the relative weight of old and new houses, and of houses in different parts of the country, over this period. The rate of appreciation to the average old house, in different regions, cannot be inferred from Manvel's figures. For a more accurate view, we must turn to detailed study of specific metropolitan areas.

III. Real Estate Values in Boston City

Several previous studies of real estate values in the City of Boston have been made. Although none is as comprehensive as Homer Hoyt's study of Chicago,[14] they indicate varying moods in the projection of real estate investment for the city's core. Alexander S. Porter in 1886 traced the assessed values and sale prices of a number of downtown properties. He found many of the properties within what had become the business district (which had been residential in 1800) had risen to 15-22 times their original values. (In some cases, the figures were based on land value, in some, on land plus buildings.) He concluded

> Real estate has always been a sure and safe investment in the long run. The old families of Boston owe much of their wealth of today to the steady, and in some cases enormous rise in the value of their houses and stores. To be sure there have been, and will be, periods of depression, when it would seem that the more real estate one has, the worse it is for him; but during all these depressions there is an undercurrent of growth that is quietly going on, which is sure to make itself felt when the tide turns and the clouds pass away.[15]

On the other hand, writing in 1941, John C. Kiley showed that, for many properties in the downtown area, per foot prices in 1930-1940 were comparable to or below the level of the 1870's, although they had risen much higher, particularly in the 1910's and 1920's. Kiley attributed part of the fall to the depression, but found other factors at work as well.

> The study of real estate values in the 1930-40 period may be divided into two parts. The first half, like other periods of real estate depression, ran parallel to the depression in securities and business. The second half seems to have had no parallel or yardstick in the history of Boston. It is within this period that the greatest recession in realty values has taken place.[16]

Kiley attributed this decline to the impact of the automobile which made available suburban land that had been selling at prices of 15¢-$2.00 per square foot, compared to prices of $25.00-$50.00 downtown, as well as to the effects of high vacancy rates following the construction boom of the 1920's and to the effects of high taxes in the city.

"I am of the opinion," Kiley concluded "that, if the present wearing down taxing conditions are allowed to continue, much of the real estate in our older cities, which was once a great contributor to national prosperity, will have so little value that it will be given back to the cities from which it was purchased in the early years of the settlement of the country."[17] But although this prediction might seem to have been borne out by the well-publicized abandonments of buildings in many cities in the late 1960's -- including some in parts of Boston -- by the late sixties land values in the business districts of the city were caught up in a new boom.

Where Porter and Kiley spoke of the city as a whole, and used evidence from the business district, other studies beginning in the 1890's, have shown considerable differences in the pattern of land value changes between neighborhoods. An exchange between Henry Whitmore and James R. Carret before the American Statistical Association in 1896 (primarily concerned with the implications of land value changes for the Single Tax proposal) yielded the calculation that land value assessments in the city, which Whitmore believed to have been made at relatively constant assessment ratios, had risen less rapidly than population and at a rate which would yield a capital gain below the return on alternative investments. Broken down by districts of the city, the changes show considerable variation. Thus for the "city proper" including the downtown area, land values had increased by 41.7% over the twenty years 1875-1895, and in the newly urbanizing Brighton district, 62.2%. However, in the older East Boston and Charlestown areas, the increases had been 7.8% and 11.1%, while in South Boston assessed land values had actually fallen.[18]

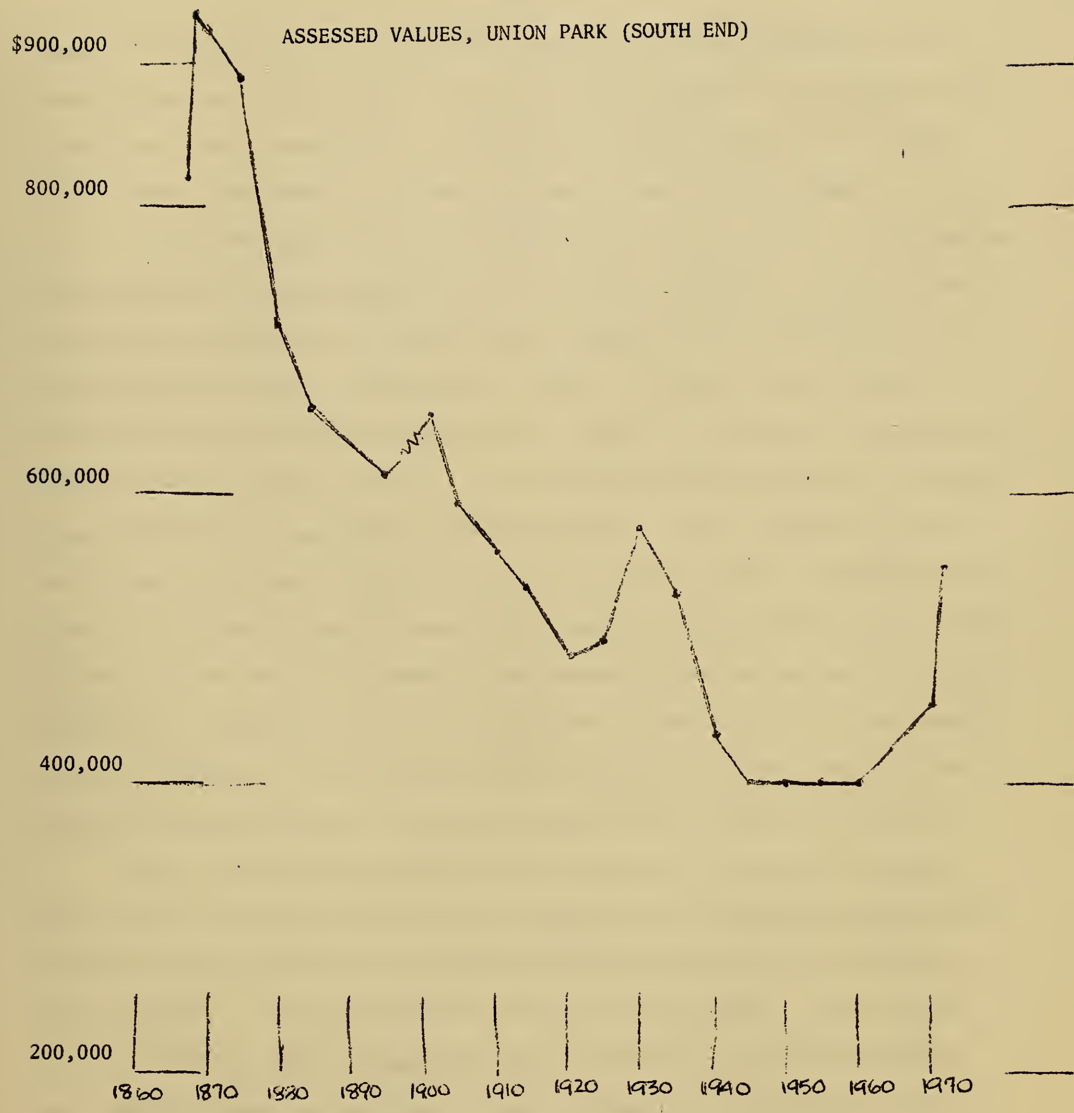
An example of land value decline was presented soon after in A. B. Wolfe's classic study of the Lodging House district in the South End. This was an area which

had been developed in the second quarter of the century and which by the last quarter was transforming into a slum. Taking figures for one block, Union Park, Wolfe showed that assessed values had fallen by 42% between 1869 and 1905. (Where sales prices were available, they showed a greater rate of decline, since houses had been assessed at 10-20% below value around 1870, but often above value by the late 1880's) A continued trace of values for the same neighborhood shows values continued to fall slowly (with an interruption in the 1920's) until the 1950's.[19] In the 1960's, however, with the expansion of the downtown business district into the Prudential Center area rehabilitation began and values moved upward rapidly, although in many cases older residents did not reap the sudden increases. (See Figure II) A study of the effects of the Prudential Center on the South End shows a wave of land value increases was preceded by a wave of sales to new owners at old prices as the pattern that swept through the district.[20]

In the twentieth century, the pattern for the rest of Boston has been quite uneven. For the city as a whole, land and property value assessments continued to rise through the 1920's, but after a sharp fall during the depression, they continued to fall slowly, rather than rising once again after World War II. In some areas, such as Brighton, decline in assessed values actually began after World War II. However, the postwar decline is apparent, rather than real, due to the sharp decline in assessment/sales price ratios; which, for the city as a whole, fell from .96 in 1946 to a mere .29 in 1972. Correcting for assessment value changes, Table II shows a 67% rise in land values per square mile between 1900 and 1924 for the city as a whole, a fall between 1925 and 1945 and a resumption of growth at about the pre-depression rate after the war so that by the end of the 1960's, values had approximately regained the 1925 level for the city as a whole. A second series on property value changes in the post-war period, an

FIGURE II

ASSESSED VALUES, UNION PARK (SOUTH END)



Sources: To 1895 - A.B. Wolfe, The Lodging House Problem in Boston
(Boston: Houghton-Mifflin, 1906)
1901 and after - City of Boston Assessing Department Files

index based on the sale prices of houses which were sold at least twice in the period, shows more rapid gains (a 4-5% annual rate through the early 1960's and a 7-8% annual rate thereafter). As with the South End subsample, the larger canvas shows a resurgence of central city land values in recent years.

However, the distribution by neighborhoods of value changes is worth noting Before 1924, the lowest increases are in the inner core values. Boston Proper (including the North, South and West Ends, the Back Bay and downtown) and East Boston actually decline. The"streetcar suburbs" of South Boston, Roxbury and Dorchester which were still being filled in during the early part of the period, show the sharpest gains, only to see values decline rapidly during the depression along with those of Charlestown and Boston Proper. On the other hand, despite the depression the more "suburban" sectors of the city to the far South and West (Hyde Park, Allston-Brighton, Jamaica Plain and West Roxbury) show value increases between 1924 and 1945. The spread of the automobile and the opening of Metropolitan District Commission roads in the Depression account for much of this growth. The only other area of increasing values in this period is East Boston, which benefits from the opening of a vehicular tunnel and the Boston area airport.

Thus, in the two pre-1945 periods of Table II, the fastest land value gains were, at each point, made by the successive "new" residential rings (the streetcar suburbs before 1925, automobile suburbs thereafter) with inner-core values stagnant. After 1945, however, there are some changes. Values in the inner core (Boston Proper, Charlestown and, after 1967, East Boston) show the most rapid increases in used house prices. Business and institutional revival of Boston brings high-income demand back to the center. Values continue to increase too in the rest of the city. The automobile commuter ring, with new housing still going up to some extent, shows the fastest land value increase

TABLE II

CHANGES IN LAND AND HOUSE VALUES, BOSTON NEIGHBORHOODS

AREA	Land value per square mile Estimated from assessments Corrected for assessment/ sale price ratios ($millions)[1]				Percent changes in estimated land value per square mile[1]			Percent change in value of resold houses[2]	
	1900	1925	1945	1970	1920-24	1924-45	1945-67	1946-67	1967-72
TOTAL CITY	25.4	42.5	20.7	40.7	+ 67.3%	- 51.3%	+ 96.6%	+ 165%	+ 42%
Boston Proper	363.0	291.5	148.9	324.1	- 19.7	- 48.9	+117.7	+ 262	+ 53
Charlestown	29.4	30.3	25.1	53.1	+ 3.1	- 17.2	+111.6	+ 204	+135
East Boston	10.7	6.0	9.7	14.0	- 43.9	+ 61.7	+ 44.3	+ 138	+ 98
Dorchester	4.6	17.0	13.3	32.6	+269.6	- 21.8	+145.1	+ 144	+ 23
Roxbury	24.9	91.5	13.4	22.8	+267.5	- 85.4	+ 70.1	+ 75	+ 21
South Boston	21.3	62.6	22.3	44.5	+193.9	- 64.4	+ 99.6	+ 151	+ 54
Allston-Brighton	7.2	7.3	12.0	29.8	+ 1.4	+ 64.4	+148.3	+ 141	+ 56
West Roxbury	4.0	4.0	5.7	13.9	0	+ 42.5	+143.9	+ 170	+ 26
Jamaica Plain								+ 147	+ 14
Hyde Park	...	1.1	3.2	10.0	...	+190.9	+212.5	+131	+ 33

1. Assessed land values reported by wards from Assessing Department, City of Boston. Assessment ratios 1900 and 1925 from calculations for this study by Barbara Sproat. Assessment ratios 1946 and 1967 computed by R. F. Engle. Border changes may bias results for 1900-24 changes.

2. Robert F. Engle, "De Facto Discrimination in Boston Residential Assessments" Unpublished paper, Department of Economics, Massachusetts Institute of Technology, March, 1973.

but the increase is less rapid in the old belt of streetcar suburbs so that in 1967, values were still below the 1924 level in Roxbury and South Boston. The return to the center -- which also affects land values in Cambridge as well as Boston -- is an exception to the general conclusion of regressive distribution of capital gains due to faster growth at the periphery. However, as the South End case suggests there is some doubt that the value increases were to any great extent received by the old residents of the neighborhood. In that neighborhood as mentioned, land turnovers tended to precede value gains; in the West End, the neighborhood was destroyed by urban renewal before gains began.

IV. Real Estate Values in the Metropolitan Area

A study of the distribution of real estate values in Boston should not limit itself to the city limits. Since the late nineteenth century, Boston has been a commuter metropolis, with a large proportion of its population living beyond the city limits in the surrounding towns and cities.[21] Using the definition of the Standard Metropolitan Statistical Area (SMSA) of the 1960 and 1970 censuses, the city of Boston contained only 42.0% of the area's population in 1895 and 23.6% in 1965. To be sure, at the turn of the century, the outer portion of what became the SMSA did not yet consist of suburbs; nor was it an empty void. There were farming communities and several self-contained manufacturing centers including Quincy to the South, Waltham to the West and Lynn and Salem to the North. Like Boston, they exerted some influence on the price of land.[22] A few centers on Route 128 have reemerged as industrial areas in recent years. However, the principal influence on real estate in the metropolitan area over the past century has been the growth of a unified metropolitan area linked by commuting and centered on Boston, and to a lesser extent, the

neighboring city of Cambridge. To study the evolution of the values of people's homes, it is necessary to extend the study to the towns to which people moved upon leaving Boston.

The study of land values during many decades of suburbanization in the Boston area is facilitated by the fact that Massachusetts has no unincorporated areas. All land is assigned to one or another town or city. Thus municipal statistics on assessed land and building values give a full accounting of real estate in the metropolitan area -- assuming the ratios of each town's assessments to market values can be known. Such ratios have been computed by the state government since 1960 and have been computed for this study for 1900 and 1925.

One complication in the analysis of the data is that a simple relation of land values to distances from the center of Boston, of the sort indicated by Figure I, does not exist. Rather, instead of a simple pattern of rings of different land uses and values around the city (as indicated by Burgess' theory) or a continuous and monotonic gradient that is uniform in all directions, there is a pronounced sectoral effect. For the past century, the Western suburbs of Boston and a few towns located on peninsulas to the East, have been the higher income suburbs, while the lower-income and industrial suburbs have, in more cases, been located directly to the North and South.

The sectors, to be sure, are not tightly segregated. Thus, for example, in 1960 median family income by town was related to location by the following regression:

$$\text{INCOME} = 6907 - 34.4\text{DNS} + 44.3\text{DEW} \qquad R^2 = .095$$

where DNS is distance north or south of a latitudinal line running through the center of downtown Boston, and DEW is distance east or west of a longitudinal line

through the same center. Although less than 10% of variance is "explained," both distance coefficients are significantly different from zero at the .05 level, with incomes falling to the north or south and rising to the east-west. Use of separate longitudinal and latitudinal distance terms has proven useful in most statistical analysis of the area. In addition, because gradients in the two directions are frequently non-linear, we have employed quadratic and cubic regressions on a number of occasions.

Both the filling in of the metropolitan area over time and the persistence of a sectoral pattern are shown by the relationship of total real estate assessments to distance from the metropolitan center. Table III presents a simple analysis of this relationship, using linear regression. The total assessments used include both land and building values and were not corrected for assessment ratios. The table shows that at least as early as 1870, real estate values fell off more rapidly toward the north or south than in the more favored east-west sector. In both directions there is a tendency toward the flattening of the gradients over time, but the extent and timing varies in the two directions. To the west, the gradient begins to flatten after 1900; to the north or south, the proportion by which values fall off in the first mile remains constant from 1890 to 1940, and only begins to decline somewhat thereafter. These figures are consistent with a filling in of the metropolitan area with higher-value urban land uses first to the west and later to the north and south. The assumption of a gradual filling-in of the area is supported by the increase of R^2 in each successive decade from 1870 to 1960, which suggests that a convex pattern may be transformed over time toward a closer approximation to a straight line. The growth of total real estate values in the area is shown not only in the flattening of the gradient (which could in

TABLE III

REGRESSION ESTIMATES OF ASSESSED REAL ESTATE VALUE GRADIENTS 1870 -1970

Year	Regression Intercept (value at Boston) (A)	North or South Change Per Mile (b_1)	East or West Change Per Mile (b_2)	R^2	Wholesale Price Index	Slope as % of intercept	
						$\frac{b_1}{A}$	$\frac{b_2}{A}$
1870	3003.6	-138.6	-113.2	.176	93	4.6	3.7
1880	3103.6	-143.5	-110.4	.257	69	4.6	3.5
1890	5767.8	-261.5	-208.4	.311	56	4.5	3.6
1900	7804.8	-354.7	-286.7	.315	56	4.5	3.7
1910	9357.9	-423.5	-335.6	.333	70	4.5	3.6
1920	10437.4	-472.0	-360.7	.387	154	4.5	3.5
		<	>				
1930	16394.4	-738.6	-556.1	.449	86	4.5	3.4
		<	>				
1940	14974.4	-669.4	-497.9	.481	79	4.5	3.3
1950	16658.8	-739.9	-547.1	.495	162	4.4	3.3
1960	19799.6	-853.4	-606.7	.536	186	4.3	3.1
1970	32375.5	-1280.5	-709.3	.342	215	3.9	2.2

Figures are in thousands of current dollars per square mile, based on a regression on town averages, of the form

$$VAL = A + b_1 DNS + b_2 DEW + e$$

where DNS is the number of miles north or south of Boston and DEW is the number of miles east or west of Boston. All values of b_1 and b_2 were significant at the .05 level.

theory be offset by falling values at the center outweighing rising suburban values) but also by rising value of the intercept term. Values at the center rise in all decades but the 1930's and their proportionate increase exceeds that of the wholesale price index for all decades but the 1910's and 1930's.

Changes in real estate value gradient do not, of course, allow for direct estimation of the capital gains received by home owners or real estate developers as a metropolitan area grows. Different densities and ages of construction in different towns may make the real estate value gradient vary considerably from the land value gradient or the gradient representing the prices of those housing types relevant to the calculation of homeowners' capital gains. What is more, real values may depart from assessed values. The results of Table III are consistent with the notion that true land value gradients are flattening and that, therefore, capital gains will be lowest in those areas where older homes have been purchased by moderate income homeowners. They suggest that gradients have been flattening over time, and confirm that the process of suburbanization, while subject to cyclical variations, has been a long-standing trend in the Boston area. However, they are not conclusive. More substantial evidence can be offered only for those sub-periods of the century considered in which either land values were reported separately from other assessments by the towns and cities of the Boston area, and in which we have been able to construct assessment/sales price ratios or the census presented figures, by towns, for house values.

V. Changes in Land Values 1900-1925

Land and building components of town real estate assessments have been reported separately in Massachusetts state documents since 1890, although the separation of land from building values has been sporadic and often arbitrary since the depression of the 1930's. Ratios of assessments to sale prices, however, are not available until the late 1890's when a stamp tax on title transfers was instituted. Stamps allow for determination of the actual sales price of properties that change hands; this price can be compared with assessments on those properties to estimate prevailing assessment ratios. Stamps have not been in use continuously, but have allowed us to sample transactions for 1900 and 1925, and to estimate town assessment ratios for those years.[23] In the 1960's the State itself began making surveys of current assessment ratios. The ratios calculated have been applied to assessments and town areas to estimate per-square-mile values for 1900, 1925 and 1970.

Using these values, it is possible to trace the evolution of land values in the suburban rings that surround the city of Boston. Unfortunately, some ambiguity arises from the estimates, but at least some estimation procedures confirm a pattern of more rapid value increases at the suburban fringe than in the older ex-suburbs of the "inner ring." In Table IV, land value changes for the suburban towns (excluding the city of Boston) are regressed directly on distances from Boston and, in some estimates, from the subordinate industrial centers of the region. As the Table shows, a linear estimate suggests land values increased faster at a greater distance from Boston than near the center in the quarter century from 1900 to 1925. Between 1925 and 1970, there is some upward slope but the linear distance variables are not significant.

If the square of latitudinal and longitudinal distance are added, prediction is improved. A clear nonlinear pattern emerges to the east and west for the 1900-1925

period, with the greatest increases in land values coming neither at the center nor at the farthest edges of the metropolitan area, but rather about 10 miles out. To the north and south, the pattern also appears to be nonlinear, but signs on DNS and DNS^2 are the reverse of those on DEW and DEW^2. The lowest increases estimated are found in a "trough" of lagging values between 2 and 5 miles north and south of the city, where values increase by less than 75%, compared with increases of more than 125%, 5-10 miles west of the city and 15 miles to the north.

In the period after 1925, quadratic estimates in both directions out from the city have positive signs on the distance terms, and negative signs on the squared terms, with steeper slopes to the north and south than to the east and west. The greatest increases indicated are at the edge of the metropolitan area (15 miles and beyond) to the west and between 10 and 15 miles to the north and south. The estimated value increases for the center of the metropolitan area, projected inward as the intercepts of equations (e) and (f) are negative, although not significant. The values presented above for Boston city, in section III, indicate that values for Boston did not, in fact, decline -- much less go below zero -- for the period 1925-1970, but Boson itself is not included in the sample used in Table IV. The indication is, at least, that close to the center of the city, land values declined, while toward the fringes of the metropolitan area, they increased rapidly. Estimated values at selected distances appear in Table V.

In neither period does distance from subordinate industrial centers affect the slopes of the gradients centered on Boston, although it does interact with the intercept term. The areas of residence immediately surrounding the subordinate centers saw their values increase somewhat below the average pace between 1900 and 1925, at (insignificantly) above the average between 1925 and 1970. While the role of subcenters in land value models is still little-explored, it appears that the decline

TABLE IV

REGRESSION ESTIMATES OF LAND VALUE CHANGES BY DISTANCE

Dependent variable is ratio of end year to beginning year land value, corrected from published figures using assessment/sales ratios. Figures given are β coefficients. Those underlined are significantly different from zero at .05 level.

	1900-1925 Changes			1925-1970 Changes		
Independent Variable	a	b	c	d	e	f
Constant	1.83	1.87	2.30	4.05	-2.13	-4.30
DNS	+.062	-.034	-.022	+.237	+1.38	+1.18
DNS^2	...	+.0048	+.0028	...	-.0573	-.0056
DEW	+.008	+.132	+.142	-.125	+.704	+.793
DEW^2	...	-.0070	-.0088	...	-.026	-.0558
DSUB	...	...	-.140	...	...	+.065
$DSUB^2$	...	...	+.010	...	...	-.0108
(R^2)	.137	.211	.261	.045	.146	.177

TABLE V

LAND VALUE CHANGES AT SELECTED DISTANCES

ESTIMATED FROM TABLE IV, EQUATIONS B AND E

Location	CHANGE 1900 - 1925	CHANGE 1925 - 1970
center	87%	loss
(north-south distances)		
2 1/2 miles	70%	0
5 miles	75%	250%
10 miles	95%	440%
15 miles	125%	430%
(east-west distances)		
2 1/2 miles	110%	loss
5 miles	130%	loss
10 miles	150%	110%
15 miles	120%	130%

in the earlier period may reflect the decreasing importance of the industrial centers themselves as New England's textile and shoe industries stagnated.

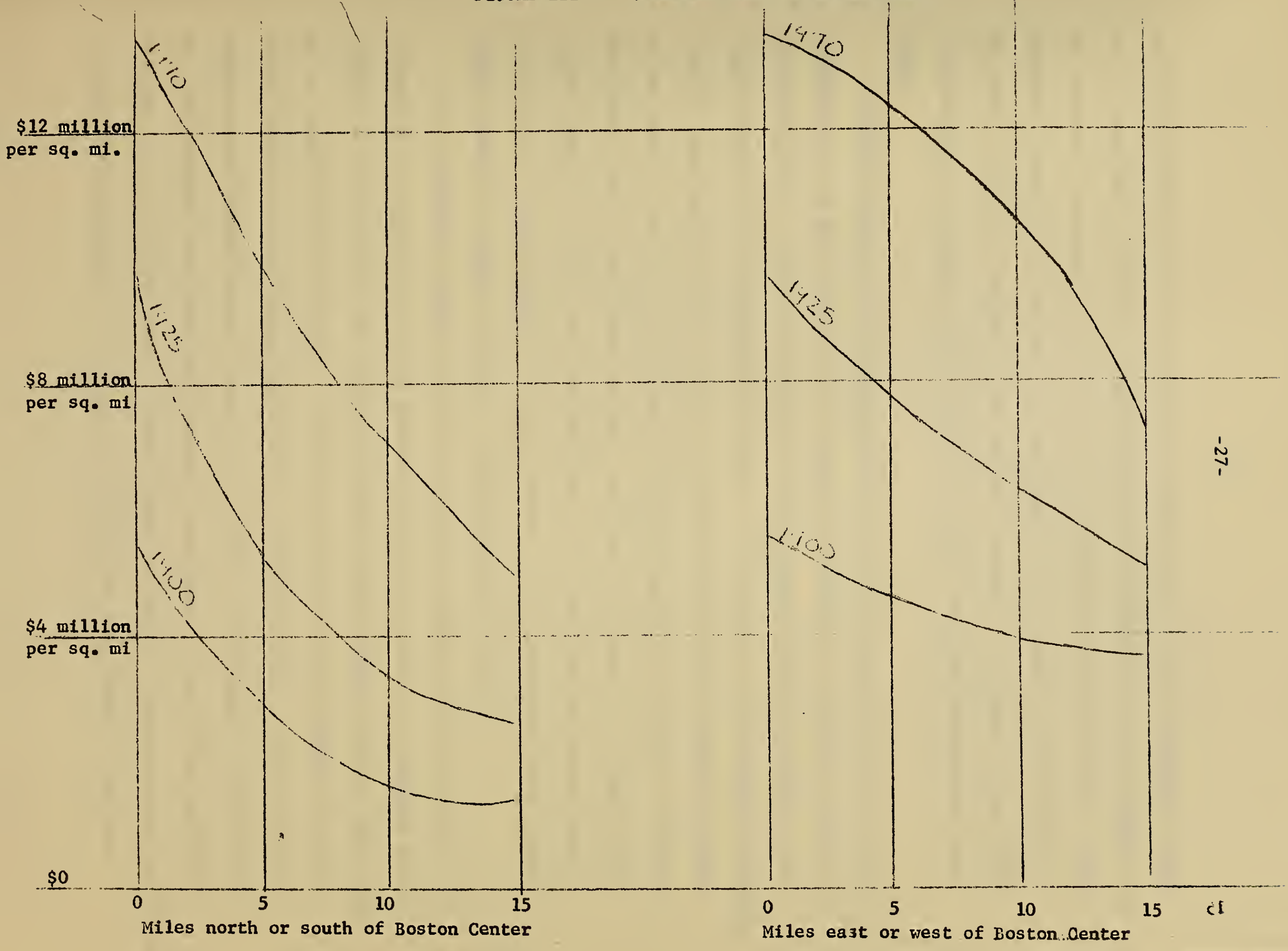
These estimates, made directly from land value ratios between years for specific towns would seem to support the hypothesis of a flattening of the land valu gradients, with the north-south gradient apparently flattening at a more rapid pace than the east-west gradient as long as land values alone are considered. However, if rather than considering changes for specific towns, separate gradients are fitted for the three years 1900, 1925, and 1970, and only then are compared, some doubt is cast on these results. When, for each year, regressions of the form

$$\frac{\text{Land Value}}{\text{Sq. Miles}} = A + b_1 DNS + b_2 DNS^2 + b_3 DEW + b_4 DEW^2 + e.$$

are estimated, the results appear to give a good fit to the data, with R^2 equal to .427 for 1900, .403 for 1925 and .477 for 1970. But the gradients, graphed in Figure III, do not show the expected flattening. Indeed, between 1900 and 1925, the east-west gradient appears to steepen, while for 1925-1970 the greatest increases come about 10 miles from the center, rather than at the extreme of the gradient.

The changes indicated by the gradients, are , in some instances, readily explicable. At the outset, in 1900, the sectoral differences between northern or southern values, and those to the west (or east, although few towns are located there), is extremely pronounced. The development of a few suburbs along rail routes to the west had begun and closer to the center of the metropolitan area, streetcar suburbanization was taking on a high-income form, with the development of Beacon Street in Brookline. Much of the development had already been anticipated by streetcar promote To the north and to the south, however, lower income industrial areas were interspersed with sectors not yet developed. It is thus not too surprising to find that, over the subsequent years, there was some "catching up" in values by the northern

FIGURE III COMPUTED LAND VALUE GRADIENTS



and southern areas as they were filled in, and connected to later transport routes. What is surprising, however, is that comparison of estimated land value changes from the gradients, presented in Table VI, with the previous estimates in Table V, yields different results as to the timing of development of the areas around 10 miles to the north and south. Analysis of the gradients suggests it happened in part before 1925; analysis of changes by towns, that the changes were more concentrated after 1925.

For those sectors of the metropolitan area that were already built up in 1900 -- extending up to 5 miles north or south (except for industrial enclaves further out) and 10 miles west -- Table VI shows some variation among these areas which is not always parallel to the indications of Table V. The analysis of the gradients suggests slightly lower rates of value increase in the 5-10 mile western suburban ring than in the center or at 5 miles north for the 1900-1925 period, where Table V indicated the highest gains in the former section. Both tables, however, show faster growth 5 miles north than 5 miles west for 1925-1970. Both also show the lowest rates of increase in the latter period in the very center of the metropolitan area although Table VI does not suggest the loss in values indicated by Table V.

These variations within the built up area are, however, only variations within a trend of what appears to be slow general growth of land values. According to the analysis of the gradients, at no distance did values double between 1900 and 1925, while in the longer period beginning in 1925 only in the outer ring of northern suburbs (about 10 miles out) did values double over the 45 year interval. While land value changes may be biased downward somewhat by a tendency of assessors to assign values to older buildings which might more properly be assigned to land,[24] the indication is, at least, that the normal course of urban growth for Boston's suburban towns and cities was only slow appreciation. Whatever the differences among towns, a long term

TABLE VI

LAND VALUE CHANGES ESTIMATED FROM QUADRATIC GRADIENTS

	CHANGE 1900 - 1925	CHANGE 1925 - 1970 1925 - 1970
Center	+ 75%	+ 38%
(north-south)		
2 miles	+ 76%	+ 52%
5 miles	+ 77%	+ 89%
10 miles	+ 97%	+112%
15 miles	+ 92%	+ 92%
(east-west)		
2 miles	+ 71%	+ 51%
5 miles	+ 67%	+ 60%
10 miles	+ 64%	+ 67%
15 miles	+ 44%	+ 39%

appreciation rate of about 2% or 2 1/2% per year was all that could be expected.

The analysis of rates of growth for specific towns, which underlies Tables IV and V show that there were departures from this pattern in many specific instances. In particular, among the rural towns becoming suburbs and among the towns of the middle ring there is greater variation than in the towns nearest to Boston. In the 1900-1925 period, for example, five towns (Duxbury, Marshfield, Norwood, Swampscott and Topsfield), all had values more than quadruple. Eleven other towns more than tripled their land value -- but only one of the 16 (Belmont) lies in part within a five-mile radius of Boston and it is an upper income enclave. Between 1925 and 1970 the majority of towns sampled (29 of 50) quadrupled in value -- although the gradients do not show any such increase. In part, the difference between the results is due to the presence of high increases in value in the corners of the metropolitan area not cut by the direct longitudinal or latitudinal lines from Boston used in the analysis. In part it is due to wide variations in changes within some of the specific rings. Among the older upper income towns, in this latter period, some including Belmont and Wellesley) had values quadruple, while others (Newton and Brookline) showed only small increases.

Not all groups of towns show such variation, however, Among the older, working class residential communities close to the core of the area, only one (Everett which was successful in attracting industry) had land valued quadruple, while in most communities they failed to double.

Clearly, the estimation procedure used for the gradients runs afoul of heteroskedasticity and other specifications will have to be attempted in later papers. The present analysis suggests however, that such specifications will show a pattern of lower rates of capital gain to land occurred in the inner ring of working class

suburbs than elsewhere while increases in middle class suburbs and the occasionally higher increases in rural fringe areas were subject to great variability.

Further analysis also is needed to determine the timing of some of the changes. For example, it appears from analysis of house values, as well as land value assessments for years in which assessment/sales ratios are unavailable that most of the increase in values 10-15 miles north of the city occurred by the mid-1950's, rather than over the entire 1925-1970 period. That is, it may have preceded the development of such towns as Needham or Stoneham as middle-income residential areas. However, since land values are not available corrected for assessment practices for all periods, analysis of these intermediate changes must, for the present, depend on house value figures from the census. These figures are analyzed in the next section of this paper.

VI. Changes in House Values 1930-1970

For the period since 1930, census estimates of the value of houses provide an alternative source of data to assessors' figures. The census figures have some obvious limitations. In the first place, the accuracy of census figures in general has been questioned for the two most recent censuses (based primarily on the obvious undercounting of the poor). Second, at best, the census figures give house values, not true land values. However, there are reasons to use these figures despite the drawbacks, particularly since, following the onset of the Depression, reliable assessors' estimates of the division land values and total real estate values become less common. First, house values are estimated from the responses of owner-occupiers, a group much less likely to be undercounted than tenants or occupants of "special places" (institutions and boarding houses). Statistical comparisons of census house values and market prices for the 1950 census show a good correspondence. The discrepancy between house values and land values (or the lack of a constant ratio between

them based either on different structural costs at different building densities, or on different lot sizes) may be reduced somewhat by a multiple regression technique including other variables besides distance alone in the explanation of house values at some point in time.

One possible check on the census estimates is a comparison of changes estimated from regressions on census data with changes estimated from a sample of properties in some of the Boston area communities which were sold two or more times in the period 1950-1970. The index of price changes for these houses was developed by Robert Engle and Donald Richter at M.I.T. to eliminate the effects of changes in housing quality on value change estimates.[25] Unfortunately, the index is available for only 28 of the 78 towns for which census data is available. Few of these are in the outer suburban ring. Changes in house values from the census (uncorrected by the addition of other variables to the regression) and from the Engle-Richter index are estimated for the 1950's and 1960's in Table VII. The general patterns emerging show some similarities, although the regressions from the smaller sample are less significant statistically, and indicate less variation between towns than do the census figures.

When cubic regressions are expanded to include terms for the proportion of houses in each town less than 10 years old (new) and the proportion more than 30 years old (old), they yield the estimates of median values presented in Table VIII. The use of cubic regressions, with separate DNS and DEW terms, increases R^2 considerably over linear or cubic terms for each period except 1960. It allows particularly for the capturing of a "trough" of low values that appeared to the north and south in 1960 as is apparent in Figure IV. This figure shows house value gradients drawn from the estimates in Table VIII, using value of 1 for old and 0 for new. This is equivalent to an assumption that all housing retained the same age despite the passage of time -- in this case an age of greater than thirty years. The same assumption is used in Table VIII to calculate percentages changes in the value of old housing for each

TABLE VII

CHANGES IN HOUSE VALUE BY DISTANCE

COMPARISON OF CENSUS AND SAMPLE RESULTS

CHANGE IN CENSUS MEDIAN HOUSE VALUE

$$1960/50 = 1.633 - \underline{.0161\text{DNS}} + .0069\text{DEW} \quad (R^2 = .\underline{108})$$

$$1970/60 = 1.241 + \underline{.0313\text{DNS}} + .0081\text{DEW} \quad (R^2 = .\underline{208})$$

CHANGE IN INDEX OF VALUE OF TWICE-SOLD HOUSES

$$1960/50 = 1.71 - .\underline{0218\text{DNS}} - .0111\text{DEW} \quad (R^2 = .179)$$

$$1970/60 = 1.638 + \underline{.0018\text{DNS}} - .0060\text{DEW} \quad (R^2 = .044)$$

Notes: Dependent Variables are Index Ratios (last year divided by first)

D = absolute value of distance north or south of downtown latitude

W = absolute value of distance west (or east) of downtown longitude

-------(underlined): t or F statistic significant at .05 level

Number of observations: census median value - 78; index of value - 28.

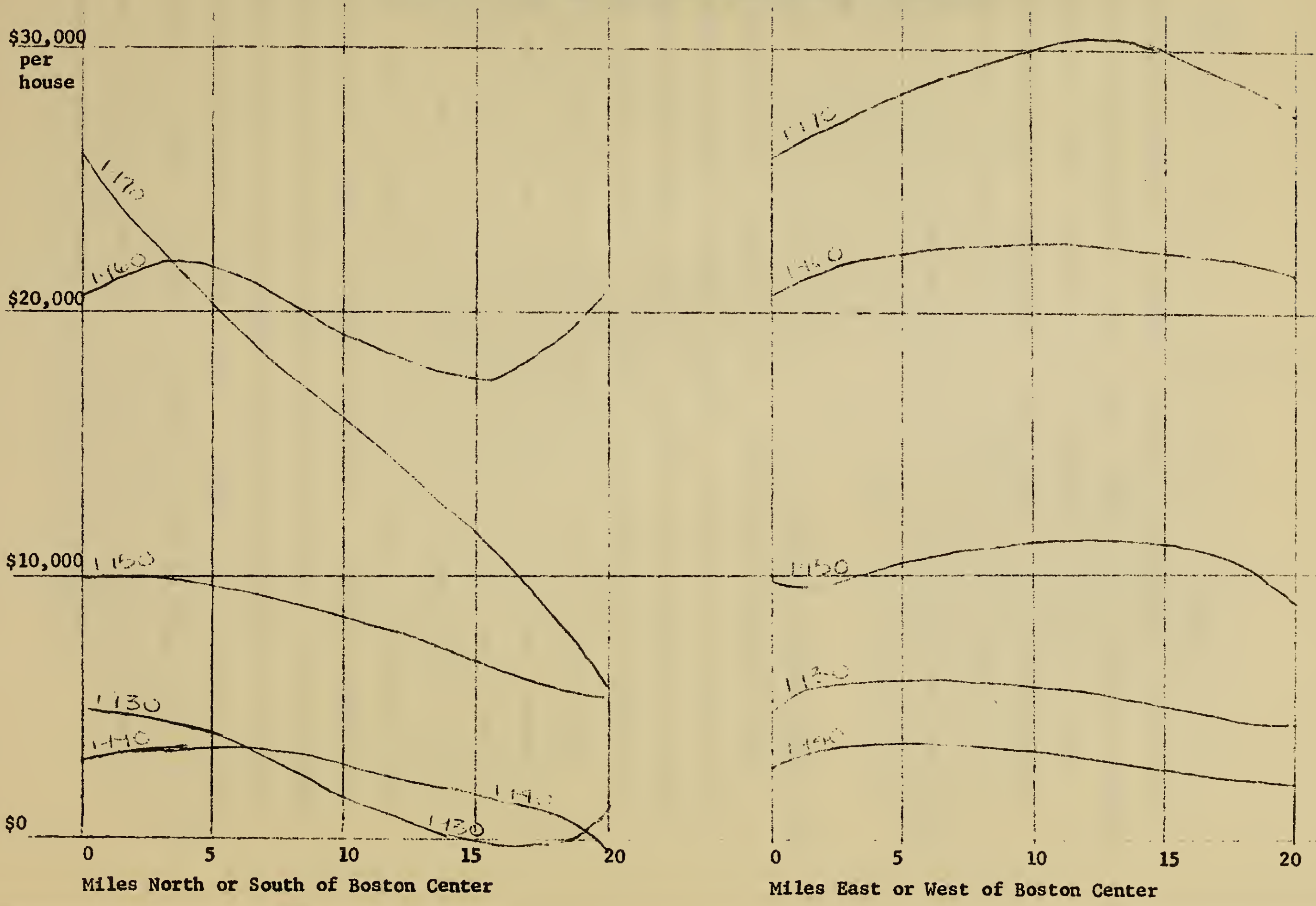
TABLE VIII

REGRESSION ESTIMATES OF MEDIAN HOUSE VALUE BY DISTANCE, 1930-1970, BOSTON AREA (Beta Coefficients in Current Dollars)

Independent Variables	1930	1940	1950	1960	1970
Constant	7368	3172	9318	13084	43230
Dns	+ 83	+227	+138	+787	-1373
Dns^2	- 32	- 36	- 42	-149	+ 550
Dns^3	+1.1	+1.0	+1.2	+5.6	- 1.1
Dew	+395	+278	+ 73	+366	+ 561
Dew^2	- 43	- 33	+ 27	- 21	- 4
Dew^3	+1.1	+0.9	-1.5	+0.3	- 1.0
OLD	- 25	- 1	+ 5	+77.9	- 195
NEW	+ 37	+106	+138	+59.2	- 170
R^2	.409	.421	.367	.279	.373

Dependent variable is median house value for each town in dollars. Dns is absolute value of distance north or south of latitude of Boston Common in miles. Dew is absolute value of distance east or west of longitude of Boston Common. OLD is percentage of housing units more than 30 years old; NEW is percent less than ten years old.

FIGURE IV: COMPUTED HOUSE VALUE GRADIENTS (OLD HOUSES)



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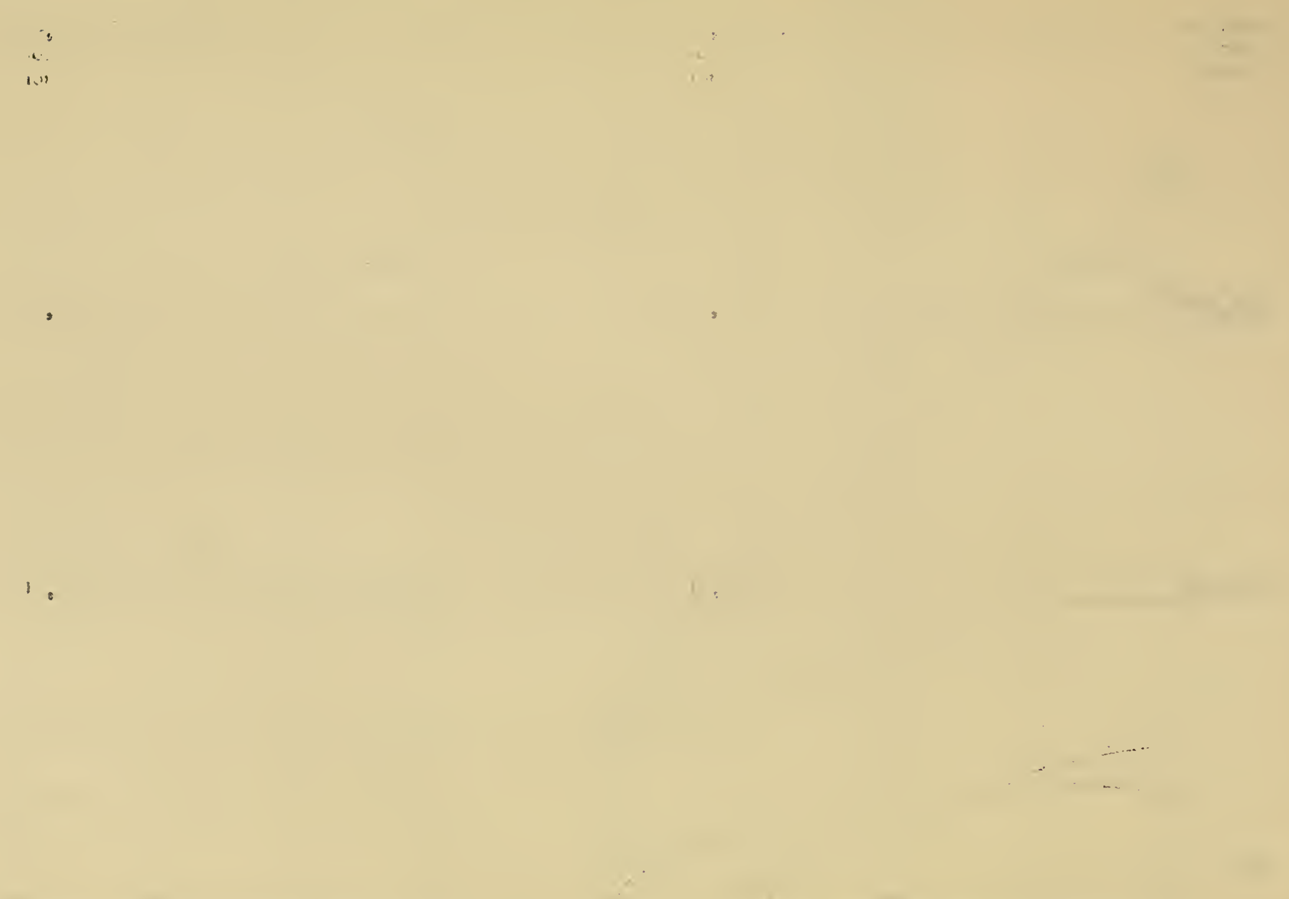

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decade. The assumptions used here may yield some bias in the results, as houses built in different decades with different characteristics may show up with different effect in the samples for different census years. However, the alternative assumption that the percentage of older housing should be increased as time goes on or that housing age should be ignored completely in the analysis, would yield results that ignored the effect of depreciation as well as being more directly affected by the degree to which housing had been constructed recently. The procedure used was adjudged the most likely to approximate actual land value changes. Alternatives under other assumptions are, however, compared below in Table X.

Results, on this assumption, presented in Table IX indicate general support for the hypotheses presented in Section II above, although some peculiarities of the Boston situation complicate the general tendencies. The fall of land values to the north or south remains steeper than that to the east or west continuing the sectoral effect noted earlier. To the west, in addition, the increase in land values over the entire period 1930-1970 is greater the farther one moves from Boston itself. However, the shift of the north-south gradient requires some particular comment, for it appears that in that direction the percentage increase in land values over the entire period is lowest at greater distances; apparently contradicting the general hypothesis. However, an explanation is available in the type of housing developed to the north and south; within the "sector" arrangement of the Boston metropolitan area, development to the north and south in the post-war period is not in most towns upper-income development. Once the effect of housing age is removed, the housing at greater north-south distances is still revealed as moderate-income housing, not luxury suburban housing. As such, it appears to yield the land value changes typical of what we have generally termed the inner ring. Specific factors of transportation policy must, however, be taken into account in considering why this occurred.

TABLE IX

PERCENTAGE CHANGES IN HOUSE VALUES BY DISTANCE

(From regressions Table VIII Assuming Old Housing)

Location	CHANGE 1930 - 40	CHANGE 1940 - 50	CHANGE 1950 - 60	CHANGE 1960 - 70	CHANGE 1930 - 70
center	-58%	219%	114%	13%	346%
(north-south distances)					
2 miles	-31%	193%	106%	3%	331%
5 miles	-25%	180%	90%	-2%	288%
10 miles	23%	199%	51%	-8%	270%
15 miles	33%	270%	14%	-9%	208%
20 miles	[128%]		377%	-56%	276%
(east-west distances)					
2 miles	-36%	119%	114%	15%	352%
5 miles	-37%	117%	108%	19%	345%
10 miles	-39%	148%	88%	26%	397%
15 miles	-41%	188%	73%	35%	477%
20 miles	-40%	170%	73%	46%	480%

TABLE X

HOUSE VALUE CHANGE ESTIMATES ON ALTERNATIVE ASSUMPTIONS

(ratios of end year/beginning year house values, by distance)

	Center	5 mi. NS	10 mi. NS	20 mi. NS	5 mi.EW	10 mi.EW	20 mi.EW
FROM REGRESSIONS EXCLUDING HOUSE AGE							
1970/60	1.856	1.394	1.433	1.180	1.904	2.082	1.960
1960/50	1.474	1.606	1.583	2.390	1.384	1.301	1.604
1950/40	3.027	2.285	2.274	2.135	2.995	3.285	3.199
1940/30	0.524	0.622	0.670	0.619	0.500	0.566	0.571
ASSUMING HOUSING OVER 30 YEARS OLD							
1970/60	1.132	0.985	1.076	0.088	1.188	1.262	1.457
1960/50	2.136	1.898	1.506	1.419	2.075	1.884	1.725
1950/40	3.196	2.794	2.989	4.437	2.171	2.476	2.704
1940/30	0.416	0.748	0.762	0.479	0.635	0.615	0.613
ASSUMING HOUSING AGED 10-30 YEARS							
1970/60	3.220	2.682	2.857	1.683	3.178	3.192	3.224
1960/50	1.403	1.534	1.516	2.781	1.419	1.334	1.517
1950/40	2.465	2.579	2.715	2.809	2.634	3.162	3.554
1940/30	0.431	0.562	0.647	0.453	0.457	0.431	0.358
FROM ENGLE SAMPLE OF TWICE-SOLD HOUSES							
1970/60	1.746	1.623	1.671	...	1.709	1.738	...
1960/50	1.589	1.600	1.434	...	1.580	1.493	...

The Depression of the 1930's is the first influence which affected housing values during the period under consideration. Housing values, like most other values fell during this period, being reduced by half at the center of the metropolitan area and by only slightly smaller amounts elsewhere in the developed portion of the metropolitan area. The western suburbs already developed as centers of affluence by the twenties, may have fallen somewhat less in value than did the working class neighborhoods closer in but they did not escape the Depression's effects. The Depression and World War II also interrupted for fifteen years the housing construction boom that had begun in the twenties, following the change from public transit to automobile commuting in the metropolis. Because of this interruption it is not surprising that house value gradients for 1950 were similar to those for 1930. The war and the post-war inflation had restored the pre-depression values, but not much else has changed as far as many portions of the area are concerned.

There is, however, one crucial point of difference. Although private housing construction was stalled during the Depression, public expenditure on roads continued.[26] In the Boston area, although some new roads were constructed to the new parkways, constructed by the Metropolitan District Commission, along its existing part rights-of-way to the north and the south into previously undeveloped towns. A tunnel giving access to the North Shore was also constructed. The result shows as a marked flattening of the north-south gradient in the thirties, so that despite the Depression, values actually rose somewhat at a distance of fifteen miles from downtown Boston. In the 1940's values continued to rise slightly more rapidly further to the north or west than they did in the ring about five miles from the center. (At the very center, however, the housing shortage of the post-war period still had an effect in 1950 and the value of housing was up by more, over 1930 levels, than it is in the western suburbs).

The empty tracts to the north and south of Boston actually filled with housing in the 1950's but no new transportation facilities followed those built in the 1930's. The increased availability of housing both at these extremes and to the west, led to decreased pressure on the housing market in all areas; the rate of increase in values is less than in the previous decade. However, at least if old housing is considered, the proportionate increase is lowest in the newly developed northern and southern suburbs. Examination of the house value gradients for 1960 shows the highest prices for housing in some older suburbs about five miles north or south of the latitude of downtown Boston and in a longer range of 5-12 miles to the west, if age is controlled for. (Not controlling for age, the house values remained high even farther to the west, where newness and larger lot sizes compensate for lower apparent land prices). Similarly, there were a few higher priced housing units far into the suburbs to the north and south. The strength of the western sector was in general, holding up at the time while the trough of values reemerging to the north or south, in Figure IV, was a first sign of weakness.

It is in the 1960's that the steep downward-sloping gradient to the north and south reemerges with an absolute decline in land values (estimated by the attribution of an old housing stock to each town) apparent at any point beyond 3 1/2 miles north or south by 1970. (If house values are not corrected for age, or if housing under 30 years old is assumed, there is no absolute decline, but values more than 5 miles to the north and south still lag relatively to all other areas). To the west, a peak in land values at 15 miles becomes more pronounced and generally the performance of land values is greatest the farther west one goes. On the other hand, even at the center of the city, as long as one does not go far north or south, land values appear to hold up almost as well as in the western suburbs. Use of the index of twice-sold houses, or the assumption of housing less than thirty years old

in deriving estimated changes from Table VIII actually yields a slightly higher value gain at the center than 10 miles to the west. (Results under different assumptions appear as Table IX). Under all assumptions the gain five miles west is lower than that at 10 miles, indicating perhaps the beginning of an inner-ring phenomenon to the west, as towns like Brookline,Belmont and Newton cease to be regarded as the prime suburbs they once were. The formerly privileged suburbs at a similar distance to the north and south (including Milton and perhaps Arlington and Medford) cease in the 1970's, to impart any upward bulge to the north-south gradient as they had in 1960. It should be noted that all of these older suburbs with the exception of a few enclaves had come to be considered as centers for the middle class arising out of immigrant origins by the post-war period, rather than as upper-class centers.

VII. Social Distribution of the Changes

The preceding section has shown that in recent decades the relative appreciation to investment in housing as varied with location in the Boston region. If the very center of the metropolitan area (only partially characterized by owner occupied housing) is excluded, then the areas with higher income residents (the suburban fringes) have shown the highest rates of increase in house values in most decades. The analysis of suburban land value assessments in section V, suggests that a similar pattern of land value change distrubitons may have occurred earlier, in the period 1900-1925, although the presence of heteroskedasticity makes our statistical test inconclusive. Within the Bsoton area there is evidence from the house value regressions for slightly faster appreciation in western than in northern or southern suburbs, as well as for a general flattening of gradients regardless of direction. The land value gradients of Figure III suggest a greater flattening toward the north and south than toward the east and west in the period under consideration; however,

the regressions using direct ratios of end to beginning year values for specific towns support the evidence of house values in pointing toward slightly lower rates of appreciation for towns in the core area around the center and extending a few miles toward the north and south than obtained in other towns.

The conclusion that land value increases vary inversely with residents' affluence is strengthened if real estate value changes are related to the residence patterns of different ethnic groups. The principal streams, numerically, of working class and poor migrants to Boston have historically been from outside of the United States, and thus leave records in the form of census estimates of foreign stock and foreign born proportions of the population in each town. To relate land value changes by community to the proportion of immigrants is a possible shortcut for relating land value changes to class.[27]

Regression of changes in house values by towns on immigrant percentages in the population demonstrates that it was in the immigrant communities in which the lowest increments to house values can be found. When house value ratios CHV between two years are stated as functions of foreign born proportions in the population at beginning years (IMM), the results are:

$$\mathrm{CHV}\ (50/30) = 2.29 - 2.97\ \mathrm{IMM}(30) \qquad (R^2 = .095)$$

$$\mathrm{CHV}\ (70/50) = 4.54 - 4.73\ \mathrm{IMM}(50) \qquad (R^2 = .113).$$

Despite the relatively low coefficients of determination, both the F-statistics and the t-statistics are significant at the .05 level. There is, as with the land value estimates, indication of a tendency for the low status (in this case, high-immigrant) communities to have lower rates of land value increase, although there is much random variation around the trend.

This is not to argue that ethnicity had an independent effect on house values. When immigrant proportion is included along with other explanatory variables such as

population density and distance from Boston, it has no significant effect on value. Rather the significant reverse relation between ethnicity alone and real estate appreciation shows that immigrants in some sense had lower opportunity to purchase the best housing assets in terms of future appreciation or had to trade off future appreciation for other characteristics of the housing purchased.

These results for Boston confirm a somewhat similar pattern that has been found for Chicago, which is also a city with a well-developed business district, old working-class neighborhoods and documented history of land values. In Chicago, Hoyt has written

> The foreign-born in general were more eager than native Americans to attain the prestige of land-ownership, which was frequently impossible for them in Europe. Prior to the shutting-off of the main current of immigration, there was a steady business in the older sections of the city in selling the poorer grade of houses to the newest immigrants and immediately making another sale to the seller of a house in a newer neighborhood...[28]

However, Hoyt shows, few sectors of the city grew in value continually. These included only the central business district and a few other points of high-intensity land use.

> The person who could select these spots in advance will reap a fortune. The other areas -- the tracts occupied by the poor and middle classes, the low-grade outlying business locations and the poorer industrial land -- will yield a profit to those who first develop them from farm land. Once such districts are improved with mediocre dwellings and filled with tenants who rank low in purchasing power, there is little hope for a further rise in land values. Owners of vacant farm land on the city's edge have then a far better chance to reap the 'unearned increment'.[29]

A general pattern of flattening gradients has also been found by Mills, using regression analysis, and data from Hoyt's study and more recent Olcott's Blue Books. Mills' analysis shows a general pattern in wbich value increases would be less for working class communities than at the fringe of urbanization, irrespective of any personal or housing characteristics of the built-up areas discussed by Hoyt.[30]

Yet to compare the appreciation of house values received by different groups is only to tell half the story. When housing is compared with other investments, even

the housing investments of the most affluent suburbanites do not necessarily compare well. Comparing the value in 1970 of $1,000 invested in housing in 1950 with $1,000 invested in competing assets yields the results shown in Table XI. The land value estimates of section V, while not conforming in all respects to the pattern of differential changes among neighborhoods shown in section VI and Table X, do confirm that for many of the built-up neighborhoods, including all the inner core of communities, overall rates of value growth were low.

This low rate of value increase for all or most residential areas is particularly important. In terms of accumulated assets, homeownership represents the most significant portion of all wealthholding by many families. Furthermore, for those families with smaller amounts of wealth a larger percentage is in the form of real estate. Lampman has shown homes are a much more widely dispersed asset than stocks or bonds.[31] Even in neighborhoods of some older sections of Boston in which rentals are concentrated, most structures are double or triple decker houses, in which the owners are one of the resident families.

The conclusion of Table XI is that even at twenty miles west of Boston, appreciation of housing did not give as great a capital gain as indicated by the Dow Jones average for stock investment. In areas of the lower income working class housing, 5 or 10 miles north of Boston, appreciation rates were lower than the rate of accumulation on Federal Housing Administration mortgages. A home buyer purchasing his house at this relatively favorable interest rate would, in these neighborhoods, not accumulate equity from the difference between home value appreciation and the interest rate paid on the loan. Only part of his actual savings from current income would be added to his equity. Those buyers 5 miles west of Boston would have covered the interest costs from appreciation, while those further west or north, or in the very center of the area would have made some capital gain on the mortgage-financed

TABLE XI

COMPARISON OF CAPITAL GAINS TO HOUSING AND OTHER ASSETS

(Estimated value in 1970 of $1,000 invested in 1950)

Housing investments by distance	Est. from Table VIII regressions [1]	Est. from used house sample [2]
center of Boston	2315	2760
5 miles North-South	1869	2600
5 miles East-West	2465	2960
10 miles North-South	1622	2390
10 miles East-West	2378	2600
20 miles North-South	loss	loss
20 miles East-West	2515	2670
Other investments & Indices	**Est. from national figures [3]**	
5% compounded annually	2786	
Consumer Price Index	1620	
Prime Rate of Interest	2000	
FHA Mortgage Rate of Interest	2920	
Dow-Jones 30 Industrials	3480	
Mutual Funds Average	7861	
Corporate Profit/Equity Ratio	8450	

1. From cubic regressions, using assumption of houses over 30 years old in each of the two time periods compared.
2. From Engle's index for sample of twice-sold used houses, regressing index change by town on distance terms (cubic form).
3. From President's Economic Report, except for Dow Jones Average (from NY Times) and Mutual Funds Average (from trade association). For the two Interest Rates and for the Corporate Profit ratio, each year's rate used to compute that year's gain. For loans made in different years on long-term basis, actual figures would vary.

portion of their investment, but not as much as from investment in stocks. Appreciation of the investment in housing did exceed the increase in consumer prices by a substantial margin in all districts: housing was, at least, a good hedge against inflation.

As a hedge against depression, housing was also a mixed blessing. Those with outstanding mortgages on their homes sometimes lost their investment through foreclosure during the nineteen thirties. Those not foreclosed, however, retained possession of an asset which appreciated faster than the New York Times stock exchange index of the period 1930-1950, although falling more rapidly during the 1930's alone. Compared with the consumer price index over the twenty year period, housing performed favorably in Boston or to the west, but may not have at all points to the north or south.

These overall findings are consistent with Lampman's findings on the period up to the early 1950's that top wealth holders, who held a smaller proportion of their assets in housing than others, received greater capital gains than other investors. Lampman found that this differential offset (except in the depression) the decline of wealth-disparities expected from the fractioning of properties in inheritance, and the similarity of savings rates out of lifetime or "permanent" personal income among different income groups. That investment in housing will not lead families to improve their ranking in wealth distribution to a significant extent with respect to top wealth holders is an even clearer conclusion than the apparent regressive distribution of housing value increments among house-owners.

The lower rate of appreciation to home ownership itself has little implication for considerations of housing market efficiency. It may indicate overinvestment in an asset if it has a lower return than other assets, but this is

not the only explanation. Overexpansion of the urban fringe through highway building may be part of the explanation, but housing does also have value in terms of current services to its users, which is estimated as an "imputed rent" in GNP figures, although not on tax returns. The capital gain is not a full measure of benefits. The conclusion from common observation that there is little supply of rental single-family housing may stem from a consumer preference against renting. But the differential capital gains discovered here may indicate that it is rational for a family to invest in one house (as a hedge against risk and for its own use) but not to invest in more than one house, if it has more money.

The principal implication of these findings would thus seem to be that there is an important difference between housing and other investments. An investment portfolio of the sort that is tied up in an occupied home may provide the owner with the best shelter he can afford, but it will not grow at the rate of the larger portfolio that will primarily include nonhousing investments (including perhaps other forms of real estate). In addition, among homeowners with little outside wealth, it will often be the case that lower-income homeowners receive less gain than those with higher income. Thus, both among different strata of the proletariat and between them and the bourgeoisie, the distribution of real estate value changes helps to maintain relative wealth disparities.

FOOTNOTES

1. Robert J. Lampman, *The Share of Top Wealth-Holders in National Wealth, 1922-1956* (Princeton, N.J.: Princeton University Press, 1962); Letitia Upton and Nancy Lyons *Basic Facts: Distribution of Personal Income and Wealth in the United States* (Cambridge, Mass.: Cambridge Institute, 1972).

2. Frederick Engels, *The Housing Question* (New York: International Publishers, n.d.; originally in German, 1872).

3. For example, see the panel discussion "Should We Encourage the Workingman To Own His Home?", *Housing Problems in America*: *Proceedings of the Second National Conference on Housing in America, 1912* (Cambridge: The University Press, 1912).

4. Sabre Foundation, *Expanded Ownership* (Washington: Sabre Foundation, 1972).

5. S. Marglin, "What Do Bosses Do?" Unpublished Working Paper, Harvard University, Dept. of Economics, 1972.

6. Matthew Edel, "Filtering in a Private Housing Market" in M. Edel and J. Rothenberg, *Readings in Urban Economics* (New York: Macmillan, 1972).

7. Wallace Oates, "The Effects of Property Taxes and Local Public Spending on Property Values: An Empirical Study of Tax Capitalization and the Tiebout Hypothesis," *Journal of Political Economy* (December, 1969); Matthew Edel and Elliott Sclar "Taxes, Spending and the Tiebout Hypothesis: What Did Oates Prove?" Paper presented Western Economic Association, 1973.

8. Edel and Rothenberg, *Op.Cit.*; William Alonso, *Location and Land Use* (Cambridge: Harvard University Press, 1964); Lowdon Wingo, Jr., *Transportation and Urban Land* (Washington: Resources for the Future, 1961); Richard Muth, *Cities and Housing* (Chicago: University of Chicago Press, 1969); Edwin S. Mills, *Studies in the Structure of the Urban Economy* (Baltimore; Johns Hopkins Press, 1972).

9. *Boston Globe*, December 14, 1969

10. Joseph S. Keiper *et. al*. *Theory and Measurement of Rent* (Philadelphia, Chilton, 1961).

11. *Ibid*.

12. Allen Manvel, Background Paper, National Commission on Urban Problems, 1969.

13. *Ibid*.

14. Homer Hoyt, *100 Years of Land Values in Chicago* (Chicago: University of Chicago Press, 1933).

15. Alexander S. Porter, "Changes of Values in Real Estate in Boston," *Collections of the Bostonian Society* I:3 (1888) 57-70.

FOOTNOTES (Cont.)

16. John C. Kiley, "Changes in Realty Values in the Nineteenth and Twentieth Centuries," *Bulletin of the Business Historical Society* (June, 1941).

17. *Ibid.* p.9.

18. Henry Whitmore, "Real Estate Values in Boston," with Comments by James R. Carret and Dudley P. Bailey, *American Statistical Association, New Series*, 33 (March, 1896), 1-17.

19. A. B. Wolfe, *The Lodging House Problem in Boston* (Boston: Houghton Mifflin, 1906).

20. Urban Field Service and Urban Planning Aid, *Report on South Urban Renewal Plan*. Prepared for Boston City Council Hearing, March 25, 1968.

21. See articles by Knights and Schnore in S. Thernstrom and R. Sennett, *Nineteenth Century Cities* (New Haven: Yale University Press, 1969).

22. The influence of surrounding manufacturing centers, including Quincy, Waltham, Lynn and Salem (in the present SMSA) as well as Brockton, Lowell, Lawrence and Haverhill was tested by adding terms for distance to the nearest of these subcenters, and the square of that distance, to the regressions reported in part VI of this paper. The new terms raised R^2 by about .02 or .03 in most regressions for 1900, 1925 and 1970. The term for distance to subcenter had a negative sign and its square a positive sign in all cases.

23. Method is described in Barbara Sproat, "Calculation of Assessment-to-Sales Ratios," memorandum prepared as appendix to this study. Regressing assessment ratios by town on the distance variables yields the results:

$$\begin{array}{llllll}
\text{RATIO (1900)} = .890 & - .020\text{DNS} & + .0008\text{DNS}^2 & - .026\text{DEW} & + .0010\text{DEW}^2 \\
\quad (r^2 = .229) & \quad (1.98) & \quad (1.64) & \quad (2.73) & \quad (2.00) \\
\text{RATIO (1925)} = .690 & + .001\text{DNS} & - .0004\text{DNS}^2 & + .002\text{DEW} & - .0005\text{DEW}^2 \\
\quad (r^2 = .353) & \quad (0.13) & \quad (1.25) & \quad (0.23) & \quad (1.49) \\
\text{RATIO (1970)} = .393 & + .024\text{DNS} & - .0005\text{DNS}^2 & + .040\text{DEW} & - .0011\text{DEW}^2 \\
\quad (r^2 = .285) & \quad (1.20) & \quad (0.54) & \quad (1.91) & \quad (1.08)
\end{array}$$

24. Mason Gaffney, "Adequacy of Land as a Tax Base," in D.M. Holland, ed. *The Assessment of Land Value* (Madison: University of Wisconsin Press, 1970).

25. Unpublished estimates by Prof. Engle and Donald Richter prepared at the Massachusetts Institute of Technology under a Ford Foundation grant, 1971.

26. Transportation history of the Boston area is reviewed in K. W. Schaeffer and Elliott Sclar, *Access for All: Transportation and Urban Growth*, in press, Ch. V and VI.

FOOTNOTES (Cont.)

27. Stephan Thernstrom, "Immigrants and WASPs: Ethnic Differences in Occupational Mobility in Boston 1890-1940" in R. Sennett and S. Thernstrom, Nineteenth Century Cities (New Haven: Yale University Press, 1969); Lloyd Rodwin, Housing and Economic Progress (Cambridge: M.I.T. Press, 1961).

28. Hoyt, Op.Cit., p. 442.

29. Hoyt, Op.Cit. p. 299

30. Edwin S. Mills, "The Value of Urban Land" in W. Perloff The Quality of the Urban Environment (Baltimore: Johns Hopkins Press, 1969), 231-253.

31. Lampman, Op.Cit.

Calculation of Assessment-to-Sales Ratios

by Barbara Sproat

The reason for attempting to generate an average assessment-to-sales ratio for 1900 and 1925 was a realization that the assessed valuation assigned by a town's assessor to a piece of property rarely reflects the full market value of that property. Since our hypotheses are based in part on the relative land values of the towns in the metropolitan area, it became important to know the true value of the land in each town at several points in time in order to correlate those land values with the other variables. We assumed that the assessed value would tend to be lower than the price the property could command on the market, but we did not know what the exact relationship between the two values would be.

The only real sources of market values of land are the prices recorded on deeds at the time individual pieces of property are sold. Since we were interested in the aggregate value of all the land in each town, we hypothesized that if we sampled the deeds on property sold in a town in a given year and compared the assessed value to the sale value of each parcel of land in the sample, we could arrive at a fairly accurate picture of the overall relationship between assessed and market values for all the land in that town in that year. This is the most frequently used method for arriving at corrected values.

We began by sending people to the Registry of Deeds in each of the five counties in the Boston SMSA. There, using deeds books from 1900 and 1925, they drew a sample of 50 property transactions in each year for each of the 78 cities and towns in the SMSA.* For each observation, as much of the following data as was available was recorded: the town in which the property was located; the street and/or lot numbers of the property

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* The sample drawn for the city of Boston was larger so that we could break the data down by neighborhoods to try to differentiate assessment patterns in the different areas of the city itself.

[illegible]

[illegible]

[illegible]

[illegible]

being sold; the full names of the buyer and seller; the size of the lot and the presence and type of buildings, if any; the value of any tax stamps affixed to the deed; the cash consideration recorded, if any; any prior mortgages being taken over by the buyer; and the total sale value of that property, which was the total of cash transaction plus mortgages. Appended mortgages on the property were also noted (represented by separate documents, usually closely following the original deed, in which the buyer "sells" his new property to a bank or to another party for part of the total sale value recorded in the original deed). If an appended mortgage was found, it often helped in determining whether the original deed represented a "straight" sale -- if the appended mortgage was for $5,000, for example, and the sale itself had been only $1,000, it was assumed that the sale was some kind of a deal, for example between relatives, for which the price recorded on the deed did not represent the true market value of the property. Tax stamps were an important tool in estimating the sale price of the property, for the cash consideration listed on the deed was rarely meaningful--it was most often listed as "$1.00 and other considerations." In each property transaction, however, $.50 worth of tax had to be paid on each $500 of cash transaction, and stamps representing the total amount of tax paid had to be affixed to the deed. Thus for every $.50 worth of tax stamps on a deed, we could assume that $500 had been paid. If a cash consideration was also listed and it seemed to correspond to the amount represented by the tax stamps, the actual cash consideration listed was used in computing the ratio for that observation; but for the most part, tax stamps were relied upon to indicate the cash value of the transaction.

After a sample of 50 transactions was drawn for a town, that sample was taken to the Assessor's Office in the town, where the assessed valuation on each property was looked up for the year in which it was sold (or one year earlier or later if the assessment could not be found in the same year the property changed hands). Locating each piece of property at the assessor's office was often difficult, due to a number of

factors which will be discussed below, but a goal was set of at least 30 completed observations out of an original sample of 50. The assessed value of the land, of the buildings, if any, and the total assessed value of the property were listed for each property which was found in the assessment records.

When a sample was completed for a town, the ratio of assessed value to sale value was calculated for each transaction. The mean of the ratios was then calculated, as well as the median, the standard deviation from the mean, and the 95% confidence interval. This mean ratio represented, to us, a fair approximation of the percentage of full market value at which the property in a town in a given year was assessed. We then looked up the aggregate assessed valuation of the land in each of the 78 cities and towns in each year for which we had generated a ratio and applied the ratio to that assessed value in order to come up with the approximate market value for the land in the town.

Many problems were encountered at all stages of the process of generating these assessment-to-sales ratios. In the very beginning, there were problems in working out a standard methodology for collecting the data from the Registry of Deeds. We had an idea of what the deeds would look like and where to find the information we needed, but the format of the deeds was not always uniform, and it was difficult to work out uniform ways of handling deviations from the standard deed pattern. The biggest problem in this respect seemed to be differentiating property sales from appended mortgages; some time was lost near the beginning of the summer when people discovered they had been including mortgages in their samples as though they were deeds, and those observations had to be discarded. In Boston, the mistake was not discovered until after all the work had been done, when it was found that half to two-thirds of the observations collected had been mortgages. Luckily, it was possible in a large number of these cases to trace back to the sale of property to which the mortgage had been appended, and thus the work done with assessment records on those observations was still useable. During the summer, data were collected for Suffolk, Middlesex and Norfolk Counties. By the end of the summer,

when data collection in Essex and Plymouth Counties was begun, the methods of recording deeds had been well enough refined that new data collectors could be warned of the pitfalls they would encounter and be prepared to handle them uniformly. As a result, the data recorded in Essex County, in particular, were much more complete and consistent than those collected in other areas of the SMSA.

The sampling method used involved drawing the first 50 deeds recorded in 1900 and 1925 for each town in the SMSA. In the case of some of the smaller, outlying towns, fewer than fifty property transactions sometimes took place in a town, particularly in 1900. In these cases, the data collectors simply took as many transactions as they could find on record, but this situation did contribute to the wide variation in sample size with which we ended up. Another problem encountered in working in the Registry of Deeds involved the existence of "funny deals"* -- for example, cases in which a person sold his property to someone in the same family for a price usually far below full market value. Even if such a "funny deal" did not involve people with the same name, it was often possible to identify the problem if the assessed value of the property was much greater than the sale value, in which case the transaction was discarded from the sample. Another variation on this problem was the case of a land owner dividing a large parcel of land into small, equal-sized lots and selling them all at approximately the same time for the same price. If a large number of these transactions was included in a town's sample, they would throw off the balance of the sample. Because the process of identifying these cases often did not take place until after the assessed values had been collected and the data were being analyzed, the sample size suffered if it included a large number of such deals.

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* This is the technical term used when assessors and realtors spoke to us informally. To lawyers these are transfers that are "not arms-length sales."

A final problem encountered in collecting data from the Registry of Deeds was that tax stamps were evidently not uniformly used throughout the SMSA, or in all years. In particular, in Essex County, the collectors finally had to include deeds without tax stamps because they were finding so few deeds with them. As it turned out, Essex County also seemed to record the actual cash consideration paid more frequently than other counties, so it was still possible to obtain large enough samples from those towns. In some cases, however, the irregular use of tax stamps became more of a problem. For example, 1900 assessment records were unavailable in Millis and 1905 was the earliest year in which they were available. However, tax stamps were not used after 1904 for a number of years and there was thus no way we could obtain a sample for Millis any time near 1900.

By far the biggest hindrance to our efforts to complete our samples was problems encountered in using assessment records. There were a number of problems in finding and identifying the correct property in the assessors' records in each town, and in general, it seemed that the more steps involved in locating the piece of property in the assessment records, the more observations dropped out of the sample.

One problem was that each town's assessment records were different. There seemed to be three main kinds of valuation records, each of which had to be used differently: one lists town residents and their holdings alphabetically, with a section towards the end of the book for non-residents; one lists town residents and their holdings by ward and precinct according to the location of the property, but alphabetically within wards and precincts; and one lists properties according to their location on the streets and lists the streets alphabetically by ward and precinct. In order to use the latter two types of records, it was necessary to obtain a street list which indicated which wards and precincts contain which streets, since the deeds did not list the properties by ward or precinct. Such street lists were not always available for the years in question, in which case lists from other years had to be used.

In addition to the problem of the organization (or lack thereof) of each town's assessment records, there were other problems involved in actually identifying the property in question. For example, the land areas indicated on the deed and in the assessment books were often only rough estimates and did not always match up with each other; in addition, the measurements were often given in different units, which necessitated converting rods to square rods to acres to square feet, etc. Another obstacle was that the land sold might represent only part of all the land owned by the buyer or seller, and the individual pieces of property owned by each person were not always itemized in a town's valuation books. It was frequently necessary to look in the years preceding and following the date of sale to try to determine what part of the seller's property seemed to have disappeared from his assessment and appeared on the buyer's assessment. Another identification problem involved the names of the buyers and sellers. If only the last names had been recorded at the deeds office and there were a number of people with that last name in the town, it was that much harder to identify the correct property. Even if the full name had been recorded from the deed, the assessment was frequently listed in the name of another family member.

A common finding was that when a parcel of land was sold in 1900 or 1925, it had no buildings on it but by the time it was assessed for that year, a building had been partially or completely erected on the site. It became important to watch for these cases, in order to compare the assessed value of the land alone with the sale value; and even then, the value of the land alone might have increased simply by virtue of the addition of a building. In addition, either the deeds or the data collectors often did not specify whether there were buildings on the property being transacted, and even if they did specify "buildings," the assessment record might mention a house, a barn, and outbuildings, for instance, and it was impossible to know whether all of those buildings existed at the time of the sale.

Probably the most difficult problem overall encountered at the assessors offices was hostility and/or incompetence from the assessors themselves. We encountered different types of negative responses in larger cities and in small towns. In the cities, the assessors often claimed that they were too busy to take people down to the vault to find records but that they could not allow the data collectors in the vaults alone. In small towns, the assessors often work only part-time, which made it harder to arrange times to use the records, and which often meant that assessment records tended to be more disorganized. Persistence became the golden virtue of data collectors; we usually found that if we called back enough times and emphasized our needs, our knowledge of how to use the records so as to inconvenience the assessor as little as possible, and our right to inspect their records, we won. Given the constraints of time and money, however, we occasionally chose to give up, at least for the moment, and concentrate on what seemed to be the more important towns. This decision accounts for missing data in four towns. The assessors of a few of the presently missing towns are still being pursued.

The other major cause of missing ratios was assessment records which were missing altogether. In a number of cases, there had been fires which destroyed the town's records; in other cases, the disappearance of records was unexplained. This problem was most common in 1900, although 1925 records were missing in three towns. In 1900, we failed to find assessment data in eight towns, and in one other town, the very few deeds which could be found for those towns were not located in the assessment books.

Finally, after the raw data had been collected and was ready to be analyzed, there were some other problems. One is the tremendous variation in final sample size for different towns. It was particularly difficult to find 50 transactions in small towns, as mentioned above and even harder to locate the assessed values of all the properties in each town. As a result, our sample sizes vary from three observations in Bedford in 1900, to 56 in Beverly in 1925 (aside from Boston, whose sample was purposely larger).

In addition, the various problems in collecting accurate data caused the reliability of the results to vary (the size of the standard deviation), and even large sample sizes did not always produce smaller standard deviations.

Another problem we found after the data had been collected was that a large number of transactions, particularly in 1900 and in smaller towns, showed tax stamp values of $500 (one $.50 tax stamp on the deed). Since $.50 was the smallest denomination of tax stamp available, a $.50 tax stamp represented a cash transaction of any amount up to $500. Thus a piece of property could appear to have been sold for $500 but have an assessed value of $30. If there was a large number of these cases in a town's sample, the mean ratio was likely to appear lower than it might have been in reality. We considered throwing out all $500 sales from the samples, but in some of the smaller towns, we would have been left with very small samples.

Another thing which was actually more of a nuisance than a serious problem was discrepancies and inconsistencies in the data collectors' methods of recording the data from the deeds and assessment records. There was a standard format which was designed at the beginning of the summer and which everyone generally followed. Sometimes, however, the position of buyer's and seller's names was reversed; this was annoying but possible to deal with if the names were still labelled with "B" and "S". But some people designed their own shorthand methods, which involved recording only the data without labels and using abbreviations which were not always clear. This was particularly problematic in the case of Boston, where a lot of the original observations turned out to be mortgages, and they had to be looked up again. On the other hand, it became clear that neatness wasn't everything, when someone who had been extremely neat in recording the data turned out to have taken down the wrong information in a large number of cases! There was a general consensus of opinion at the end of the summer

that the more data, particularly on location and size of the property, that had been taken down at the Registry, the easier it was to locate that property in the assessment records.

In calculating the mean assessment-to-sales ratio for each sample, we decided to discard any ratios which came out to above 1.2 (that is, the assessed value of the property was more than 20% higher than the market value), on the assumption that a property owner would not tolerate being taxed on the basis of an assessed valuation which was more than 20% higher than the actual value of his property.

Attached is a table showing the mean ratio of assessed to market value in each town for 1900 and 1925, as well as the standard deviation from that mean in each sample, and the number of observations from which the mean was calculated.

			1900			1925	
CITIES & TOWNS	COUNTY	MEAN RATIO	STAN. DEV.	N	MEAN RATIO	STAN. DEV.	N
Arlington	M	.60	.28	27	.68	.25	31
Ashland	M	---------------			------------------		
Bedford	M	.67	.21	3	.64	.22	15
Belmont	M	.65	.24	31	.65	.21	32
Beverly	E	.61	.29	43	.63	.16	56
Boston	S	.80	.25	117	.70	.18	210
Braintree	N	.73	.29	21	.60	.23	33
Brookline	N	.82	.18	31	.88	.18	42
Burlington	M	---------------			.66	.24	27
Cambridge	M	.83	.25	21	.60	.23	32
Canton	N	.69	.20	19	.56	.23	34
Chelsea	S	---------------			.91	.13	20
Cohasset	N	---------------			.69	.19	29
Concord	M	.74	.27	21	.53	.19	21
Danvers	E	.75	.29	37	.65	.19	48
Dedham	N	.69	.29	36	.67	.25	32
Dover	N	.52	.26	10	.62	.24	9
Duxbury	P	.68	.31	24	.54	.26	38
Everett	M	.84	.20	38	.74	.18	37
Framingham	M	.68	.32	21	.57	.15	27
Hamilton	E	.60	.31	27	.57	.29	39
Hanover	P						
Hingham	P	.63	.30	24	.72	.22	39
Holbrook	N	---------------			.56	.21	41
Hull	P	.61	.21	27	.66	.21	17

CITIES & TOWNS	COUNTY	1900 MEAN RATIO	1900 STAN. DEV.	1900 N	1925 MEAN RATIO	1925 STAN. DEV.	1925 N
Randolph	N	.73	.23	27	.66	.31	39
Reading	M	.77	.24	25	.70	.27	29
Revere	S	.82	.24	33	.75	.29	36
Rockland	P	.64	.31	28	.61	.19	36
Salem	E	.81	.24	36	.66	.14	49
Saugus	E	.65	.33	35	.63	.22	47
Scituate	P	.71	.28	21	.67	.22	38
Sharon	N	.65	.28	40	.75	.24	39
Sherborn	M	.59	.38	8	.57	.18	8
Somerville	M	.76	.23	23	.64	.18	30
Stoneham	M	.87	.20	29	.62	.27	31
Sudbury	M	---------------			.46	.24	15
Swampscott	E	.78	.28	33	.61	.18	49
Topsfield	E	.55	.27	9	.47	.20	15
Wakefield	M	.71	.28	30	.65	.28	33
Walpole	N	.69	.31	13	.50	.20	35
Waltham	M	.80	.21	30	.71	.24	34
Watertown	M	.67	.29	32	.59	.19	34
Wayland	M	.76	.27	9	.55	.24	31
Wellesley	N	.54	.23	42	.62	.26	41
Wenham	E	.49	.28	26	.53	.31	17
Weston	M	.78	.26	18	.59	.20	17
Westwood	N	---------------			.58	.27	14
Weymouth	N						
Wilmington	M	---------------			-----------------		

CITIES & TOWNS	COUNTY	1900 MEAN RATIO	1900 STAN. DEV.	1900 N	1925 MEAN RATIO	1925 STAN. DEV.	1925 N
Lexington	M	.77	.28	25	.58	.21	29
Lincoln	M	.51	.38	5	.51	.20	11
Lynn	E	.87	.24	31	.56	.17	47
Medfield	E	.55	.28	20	.46	.16	32
Malden	M	.79	.24	29	.61	.24	35
Manchester	E	.46	.24	46	.51	.24	42
Marblehead	E	.60	.27	33	.59	.20	49
Marshfield	P	.80	.17	24	.58	.21	32
Medfield	N	---	---	---	.61	.23	17
Medford	M	.84	.24	17	.71	.18	23
Melrose	M	.84	.26	37	.73	.24	25
Middleton	E	.81	.35	7	.52	.26	37
Millis	N	---	---	---	.45	.23	9
Milton	N	.65	.24	35	.58	.15	31
Nahant	E	.74	.27	26	.55	.27	42
Natick	M	.65	.25	31	.49	.22	24
Needham	N	.62	.32	39	.59	.26	39
Newton	M	.68	.29	25	.61	.13	32
Norfolk	N	.65	.35	8	.38	.22	6
North Reading	M	.82	.32	12	.58	.31	27
Norwell	P	.59	.33	18	.58	.27	19
Norwood	N	.68	.29	33	.61	.28	37
Peabody	E	.68	.31	38	.57	.17	51
Pembroke	P	.75	.33	25	---	---	---
Quincy	N	.68	.22	40	.87	.22	29

CITIES & TOWNS	COUNTY	1900* MEAN RATIO	STAN. DEV.	N	1925 MEAN RATIO	STAN. DEV.	N
Winchester	M	.57	.25	24	.80	.20	33
Winthrop	S	.80	.24	18	.74	.24	26
Woburn	M	---------------			.49	.20	38
Bost. Proper		.82	.23	28	.81	.16	63
Allston		.63	.36	10	.69	.20	12
Charlestown		.94	.14	5	-----------------		
E. Boston		.84	.22	11	.63	.13	19
Dorchester		.80	.24	29	.64	.17	46
Roxbury		.84	.24	10	.68	.19	23
W. Roxbury		---------------			.67	.17	33
S. Boston		.78	.26	24	.67	.20	14

1900

CITIES & TOWNS	COUNTY	PUB. LVAL.	EFF. LVAL.	PUB.R.E.VAL.	EFF. R.E. VAL.
Arlington	M	3,388,603	5,647,672	7,776,054	12,960,090
Ashland	M	320,479		950,090	
Bedford	M	365,283	545,199	1,005,561	1,500,837
Belmont	M	1,903,740	2,928,831	3,835,740	5,901,138
Beverly	E	5,494,525	9,007,418	11,964,050	19,613,196
Boston	S	532,933,500	666,166,870	902,490,700	1,128,113,300
Braintree	N	1,676,300	2,296,301	3,998,850	5,477,877
Brookline	N	32,011,600	39,037,926	54,453,100	66,406,219
Burlington	M	282,279		496,864	
Cambridge	M	32,011,100	38,567,590	76,600,700	92,290,000
Canton	N	944,505	1,368,848	2,614,775	3,789,529
Chelsea	S	7,901,350		21,381,250	
Cohasset	N	948,148		2,943,457	
Concord	M	1,449,399	1,958,647	3,429,199	4,634,053
Danvers	E	1,489,750	1,986,333	3,931,110	5,241,480
Dedham	N	1,841,538	2,668,896	7,283,325	10,555,543
Dover	N	230,198	442,688	518,254	996,642
Duxbury	P	439,769	646,719	1,420,834	2,089,462
Everett	M	6,708,500	7,986,310	17,332,650	20,634,107
Framingham	M	2,396,880	3,524,824	7,340,150	10,794,338
Hamilton	E	490,275	817,125	1,247,015	2,078,358
Hanover	P	273,238		923,184	
Hingham	P	1,035,492	1,643,638	3,109,586	4,935,851
Holbrook	N	352,625	457,955	1,099,590	1,428,039
Hull	P	2,280,327	3,739,061	3,984,164	6,531,416

1900

CITIES & TOWNS	COUNTY	PUB. LVAL.	EFF. LVAL.	PUB.R.E.VAL.	EFF. R.E. VAL.
Lexington	M	2,179,210	2,830,143	4,435,860	5,760,857
Lincoln	M	444,258	871,094	930,993	1,825,476
Lynn	E	19,027,675	21,870,890	42,364,060	48,694,321
Lynnfield	E	265,234	482,244	602,409	1,095,289
Malden	M	10,186,200	12,893,924	23,984,700	30,360,379
Manchester	E	2,326,435	5,057,467	4,664,595	10,140,423
Marblehead	E	2,608,148	4,346,913	5,553,048	9,255,080
Marshfield	P	411,690	514,613	1,223,435	1,529,294
Medfield	N	305,334		1,100,783	
Medford	M	8,587,700	10,223,452	16,980,000	20,214,285
Melrose	M	4,398,150	5,235,893	11,980,675	14,262,708
Middleton	E	210,400	259,753	517,925	639,414
Millis	N	208,370		631,425	
Milton	N	4,859,600	7,476,308	9,266,400	14,256,000
Nahant	E	1,418,862	1,917,381	2,599,182	3,512,408
Natick	M	1,807,050	2,780,077	4,953,675	7,621,038
Needham	N	1,288,515	2,078,250	3,126,220	5,042,290
Newton	M	22,641,400	33,296,176	45,363,800	66,711,470
Norfolk	N	195,728	301,120	464,836	715,132
North Reading	M	221,110	269,646	505,610	616,598
Norwell	P	247,835	420,059	685,165	1,161,297
Norwood	N	1,250,649	1,839,190	3,584,214	5,270,903
Peabody	E	2,277,900	3,349,853	5,802,100	8,532,500
Pembroke	P	259,750	346,333	566,370	755,160
Quincy	N	8,826,600	12,980,294	17,790,000	26,161,764

1900

CITIES & TOWNS	COUNTY	PUB.LVAL.	EFF. LVAL.	PUB.R.E.VAL.	EFF. R.E. VAL.
Randolph	N	549,375	753,253	1,650,550	2,261,027
Reading	M	1,475,736	1,916,540	3,855,671	5,007,365
Revere	S	5,576,950	6,801,159	10,067,000	12,276,829
Rockland	P	713,916	1,115,494	2,632,721	4,113,627
Salem	E	7,000,300	8,642,346	18,910,900	23,346,790
Saugus	E	1,379,385	2,122,131	3,496,335	5,378,977
Scituate	P	963,715	1,357,345	2,458,665	3,462,908
Sharon	N	646,400	994,462	1,682,870	2,589,031
Sherborn	M	336,840	570,915	726,455	1,231,280
Somerville	M	20,138,100	26,497,500	47,430,000	62,407,894
Stoneham	M	2,188,800	2,515,862	4,663,500	5,360,345
Sudbury	M	430,975		911,375	
Swampscott	E	1,851,576	2,373,815	4,446,900	5,701,154
Topsfield	E	239,680	435,782	587,360	1,067,927
Wakefield	M	3,204,300	4,513,099	6,788,545	9,561,331
Walpole	N	686,315	994,659	2,107,884	3,054,904
Waltham	M	6,423,700	8,029,625	14,938,100	18,672,625
Watertown	M	4,228,600	6,311,343	9,115,450	13,605,149
Wayland	M	589,045	775,059	1,404,620	1,848,184
Wellesley	N	2,663,475	4,932,361	5,460,125	10,111,342
Wenham	E	309,075	630,765	805,925	1,644,745
Weston	M	1,185,050	1,519,295	2,408,425	3,087,724
Westwood	N	532,283		1,096,383	
Weymouth	N	1,691,807		5,622,096	
Wilmington	M	372,420		1,001,250	

CITIES & TOWNS	COUNTY	PUB.LVAL.	EFF. LVAL.	PUB.R.E.VAL.	EFF. R.E. VAL.
Winchester	M	3,291,705	5,774,921	7,390,955	12,966,587
Winthrop	S	3,258,375	4,072,969	6,799,850	8,499,813
Woburn	M	3,510,586		8,594,001	
Boston Proper		378,167,300	461,179,634	575,375,100	701,676,951
Allston/Brighton		14,798,000	23,488,889	25,718,600	40,823,174
Charlestown		18,533,800	19,716,809	32,726,700	34,815,638
East Boston		10,787,400	12,842,143	24,409,900	29,059,405
Dorchester		24,588,900	30,736,125	59,462,400	74,328,000
Roxbury		35,791,600	42,609,048	84,788,500	100,938,690
W. Roxbury *		21,425,700	26,782,125	44,537,200	55,671,500
S. Boston		17,308,700	22,190,641	33,435,000	42,865,385
Jamaica Plain *		11,542,100	14,427,625	22,037,300	27,546,625
Hyde Park		3,870,275		9,443,725	

* No 1900 sample for W. Roxbury/Jamaica Plain; ratio used is total Boston ratio, 1900.

	1900		1925	
CITIES & TOWNS	PUB.TOTAL VAL.	EFF. TOTAL VAL.	PUB.TOTAL VAL.	EFF. TOTAL VAL.
Arlington	$ 8,748,206	14,580,343	42,287,387	62,187,333
Ashland	1,039,354		2,281,210	
Bedford	1,104,477	1,648,473	2,568,533	4,013,333
Belmont	5,211,725	8,018,038	26,079,175	40,121,807
Beverly	16,135,475	26,451,598	45,686,725	72,518,611
Boston	1,129,175,832	1,411,469,790	1,862,799,900	2,661,142,715
Braintree	4,638,650	6,354,315	16,674,250	27,790,416
Brookline	77,952,900	95,064,512	136,797,100	155,451,250
Burlington	574,932	-----	2,065,085	3,128,917
Cambridge	94,465,930	113,814,373	166,483,200	277,472,000
Canton	3,957,630	5,735,696	8,191,990	14,628,553
Chelsea	23,711,750	-----	52,701,950	57,914,230
Cohasset	5,550,262	-----	9,363,410	13,570,159
Concord	4,684,363	6,330,220	8,217,039	15,503,847
Danvers	5,227,990	6,970,653	11,177,425	17,196,038
Dedham	8,807,220	12,764,086	19,729,100	29,446,417
Dover	860,300	1,654,423	3,353,289	5,408,531
Duxbury	1,652,851	2,430,663	5,219,980	9,666,630
Everett	18,705,100	22,267,976	55,627,150	75,171,824
Framingham	8,809,900	12,955,735	28,003,359	49,128,700
Hamilton	2,299,870	3,833,117	5,166,848	9,064,646
Hanover	1,231,009		2,533,410	
Hingham	4,152,059	6,590,570	13,435,260	18,660,083
Holbrook	1,217,680	1,581,403	2,881,154	5,144,918
Hull	4,118,111	6,751,002	16,972,715	25,716,234

CITIES & TOWNS	1900		1925	
	PUB. TOTAL VAL.	EFF. TOTAL VAL.	PUB. TOTAL VAL.	EFF. TOTAL VAL.
Lexington	$ 5,182,060	6,729,948	14,648,461	25,255,967
Lincoln	2,237,295	4,386,853	2,348,836	4,605,561
Lynn	51,593,386	59,302,742	119,821,665	213,967,258
Lynnfield	672,245	1,222,264	2,700,197	5,869,993
Malden	27,287,540	34,541,189	59,323,350	97,251,393
Manchester	8,723,604	18,964,356	12,126,280	23,777,019
Marblehead	6,515,279	10,858,798	16,927,010	28,689,847
Marshfield	1,329,245	1,661,556	5,155,975	8,889,612
Medfield	1,452,656	-----	2,391,112	3,919,856
Medford	19,776,400	23,543,333	59,441,500	83,720,422
Melrose	12,778,365	15,212,339	28,757,700	39,394,109
Middleton	569,923	703,608	1,505,638	2,895,458
Millis	698,375	-----	2,701,154	6,002,564
Milton	20,848,999	32,075,383	27,636,615	47,649,336
Nahant	5,374,540	7,262,892	4,695,412	8,537,113
Natick	5,989,075	9,213,962	10,694,025	21,824,540
Needham	3,406,360	5,494,129	15,691,843	26,596,344
Newton	57,634,720	84,756,941	117,850,800	193,198,032
Norfolk	598,715	921,100	1,509,015	3,971,092
North Reading	555,429	677,352	2,010,070	3,465,638
Norwell	850,074	1,440,803	1,724,790	2,973,776
Norwood	4,476,809	6,583,543	24,089,870	39,491,590
Peabody	8,143,520	11,975,764	22,159,840	38,876,912
Pembroke	623,410	831,213	2,519,555	-----
Quincy	20,291,376	29,840,258	109,053,625	125,348,994

	1900		1925	
CITIES & TOWNS	PUB.TOTAL VAL.	EFF. TOTAL VAL.	PUB. TOTAL VAL.	EFF.TOTAL VAL.
Randolph	$ 1,904,450	2,608,836	4,482,950	6,792,348
Reading	4,412,574	5,730,616	13,283,985	18,977,121
Revere	10,217,460	12,460,317	38,021,400	50,695,200
Rockland	3,176,644	4,963,506	7,839,110	12,851,000
Salem	27,876,291	34,415,174	52,401,290	79,395,893
Saugus	3,676,839	5,656,675	11,893,902	18,879,209
Scituate	2,642,700	3,722,113	11,083,375	16,542,350
Sharon	1,840,700	2,831,846	5,286,000	7,048,000
Sherborn	836,170	1,417,237	1,659,467	2,911,346
Somerville	52,513,400	69,096,578	104,769,800	163,702,812
Stoneham	5,143,300	5,911,839	10,603,375	17,102,217
Sudbury	1,176,572	-----	1,857,540	4,038,130
Swampscott	5,585,175	7,160,480	19,513,791	31,989,821
Topsfield	859,435	1,562,609	2,797,743	5,952,645
Wakefield	7,765,215	10,936,922	19,983,335	30,743,592
Walpole	2,665,680	3,863,304	10,948,549	21,897,098
Waltham	20,049,939	25,062,423	48,843,350	68,793,450
Watertown	10,743,242	16,034,689	38,695,847	65,586,181
Wayland	1,649,275	2,170,099	4,648,114	8,451,116
Wellesley	8,936,675	16,549,398	27,705,925	44,686,975
Wenham	1,032,000	2,106,122	2,995,687	5,652,240
Weston	4,435,527	5,686,573	7,377,347	12,503,977
Westwood	1,314,895	-----	3,808,374	6,566,162
Weymouth	6,694,088		30,759,443	
Wilmington	1,095,877		3,311,771	

	1900		1925	
CITIES & TOWNS	PUB. TOTAL VAL.	EFF. TOTAL VAL.	PUB.TOTAL VAL.	EFF.TOTAL VAL.
Winchester	$ 8,483,680	14,883,649	26,249,300	32,811,625
Winthrop	6,998,225	8,747,781	22,659,000	30,620,270
Woburn	10,555,975	-----	18,713,731	38,191,287
Boston Proper	744,888,600	908,400,731	810,035,700	1,000,044,000
Allston-Bri.	31,045,400	49,278,413	64,314,400	93,209,275
Charlestown	36,437,100	38,762,872	33,737,900	* 48,197,000
E. Boston	26,015,000	30,970,238	20,902,500	33,178,571
Dorchester	65,872,900	82,341,125	119,523,000	186,754,680
Roxbury	94,790,100	112,845,357	347,215,300	510,610,730
W. Roxbury	56,742,900	* 70,928,625	56,761,100	84,718,059
S. Boston	36,647,700	46,984,231	172,096,600	256,860,590
Jamaica Plain	24,795,000	* 30,993,750	13,412,900	20,019,253
Hyde Park	10,554,250		21,126,600	31,532,238

* No 1900 sample for W. Roxbury/Jamaica Plain; ratio used is total Boston ratio, 1900. No 1925 sample for Charlestown; ratio used is total Boston ratio, 1925.

1925

CITIES & TOWNS	PUB.LAND VALS.	EFF. LAND VALS.	PUB.R.E.VALS.	EFF.R.E. VALS.
Arlington	$ 8,046,837	11,833,584	38,115,587	56,052,334
Ashland	481,255		1,869,025	
Bedford	774,253	1,209,770	2,258,193	3,528,427
Belmont	5,926,379	9,117,506	23,933,690	36,821,062
Beverly	14,565,100	23,119,206	38,854,050	61,673,095
Boston	884,606,300	1,263,723,200	1,685,597,700	2,407,996,700
Braintree	4,293,275	7,155,458	14,971,675	24,952,791
Brookline	41,042,100	46,638,750	118,880,800	135,091,810
Burlington	866,361	1,312,668	1,777,818	2,693,664
Cambridge	58,063,300	96,772,166	146,132,200	243,553,667
Canton	1,955,070	3,491,196	6,209,220	11,087,892
Chelsea	10,185,800	11,193,186	44,852,050	49,287,967
Cohasset	3,515,238	5,094,548	8,530,263	12,362,700
Concord	2,104,082	3,969,966	6,856,454	12,936,705
Danvers	2,427,875	3,735,192	9,718,475	14,951,500
Dedham	5,442,025	8,122,425	16,319,675	24,357,723
Dover	764,200	1,232,581	2,765,725	4,460,847
Duxbury	1,431,864	2,651,600	4,821,157	8,928,069
Everett	10,752,600	14,530,540	46,237,150	62,482,635
Framingham	5,828,060	10,224,666	22,571,090	39,598,403
Hamilton	1,487,720	2,610,035	4,475,395	7,851,570
Hanover	471,330		1,991,290	
Hingham	3,697,450	5,135,347	11,831,200	16,432,222
Holbrook	516,560	922,428	2,401,160	4,287,786
Hull	5,314,460	8,052,212	15,563,705	23,581,371

1925

CITIES & TOWNS	PUB.LAND VALS.	EFF. LAND VALS.	PUB.R.E. VALS.	EFF. R.E. VALS.
Lexington	$ 3,694,549	6,369,912	12,871,090	22,191,534
Lincoln	712,765	1,397,578	2,019,475	3,959,755
Lynn	35,786,685	63,904,794	102,056,235	182,243,260
Lynnfield	786,965	1,710,793	2,398,990	5,215,196
Malden	13,945,050	22,860,737	50,705,750	83,124,180
Manchester	5,040,960	9,884,235	10,385,475	20,363,676
Marblehead	7,281,700	12,341,864	15,476,700	26,231,694
Marshfield	1,326,000	2,286,207	4,836,650	8,339,052
Medfield	514,657	843,700	1,957,173	3,208,480
Medford	13,926,750	19,615,140	53,851,850	75,847,676
Melrose	6,875,500	9,418,493	25,574,500	35,033,561
Middleton	316,330	608,326	1,356,030	2,607,750
Millis	386,985	859,967	2,152,535	4,783,411
Milton	7,850,325	13,535,043	24,388,275	42,048,750
Nahant	1,785,046	3,245,538	4,304,451	7,826,275
Natick	2,224,075	4,538,929	8,914,850	18,193,571
Needham	4,133,850	7,006,525	13,814,450	23,414,322
Newton	30,848,750	50,571,721	101,498,800	166,391,470
Norfolk	316,115	831,881	1,091,810	2,873,184
North Reading	584,645	1,008,009	1,812,030	3,124,190
Norwell	381,940	658,517	1,471,775	2,537,543
Norwood	5,427,690	8,897,852	19,612,360	32,151,409
Peabody	4,246,650	7,450,263	17,236,050	30,238,684
Pembroke	724,360		2,100,520	
Quincy	35,575,650	40,891,551	95,937,700	110,273,210

1925

CITIES & TOWNS	PUB.LAND VALS.	EFF. LAND VALS.	PUB. R.E. VALS.	EFF. R.E. VALS.
Randolph	$ 1,088,050	1,648,561	3,673,150	5,565,379
Reading	3,600,655	5,143,793	11,749,305	16,784,721
Revere	11,906,150	15,874,866	34,548,650	46,064,866
Rockland	1,710,784	2,804,564	6,367,355	10,438,286
Salem	13,098,375	19,846,022	41,536,270	62,933,742
Saugus	3,468,519	5,505,586	10,739,570	17,046,936
Scituate	3,161,600	4,718,806	9,693,195	14,467,455
Sharon	1,152,058	1,536,077	4,420,923	5,894,564
Sherborn	506,575	888,728	1,395,550	2,448,333
Somerville	26,624,850	41,601,328	95,027,000	148,479,680
Stoneham	2,872,500	4,633,065	9,308,875	15,014,314
Sudbury	530,190	1,152,587	1,586,905	3,449,793
Swampscott	6,706,391	10,994,083	17,870,147	29,295,322
Topsfield	1,033,350	2,198,617	2,444,658	5,201,400
Wakefield	3,855,365	5,931,331	16,944,075	26,067,807
Walpole	1,448,479	2,896,958	7,373,858	14,747,716
Waltham	10,331,550	14,551,478	38,100,300	53,662,394
Watertown	8,235,870	13,959,101	33,894,030	57,447,508
Wayland	1,585,777	2,883,231	4,160,165	7,563,936
Wellesley	7,542,600	12,165,483	24,664,575	39,781,572
Wenham	634,245	1,196,689	2,541,745	4,795,745
Weston	2,477,000	4,198,305	6,296,200	10,671,525
Westwood	1,063,755	1,834,060	3,100,995	5,346,543
Weymouth	4,513,333		22,226,236	
Wilmington	725,464		2,924,544	

1925

CITIES & TOWNS	PUB. LAND VALS.	EFF. LAND VALS.	PUB. R.E. VALS.	EFF. R.E. VALS.
Winchester	$ 6,299,775	7,874,719	22,999,650	28,749,562
Winthrop	5,711,550	7,718,311	21,124,200	28,546,216
Woburn	3,974,640	8,111,510	15,102,430	30,821,285
Boston Proper	493,463,400	609,214,070	703,419,400	868,419,010
Allston - Bri.	17,392,200	25,206,086	59,605,000	86,384,057
Charlestown *	14,386,700	20,552,428	31,356,800	44,795,428
E. Boston	7,804,200	12,387,619	19,309,900	30,650,634
Dorchester	36,902,500	57,660,156	113,384,000	117,162,500
Roxbury	158,712,400	233,400,580	317,764,000	467,300,000
W. Roxbury	15,306,600	22,845,671	53,184,700	79,380,149
S. Boston	86,010,500	128,373,880	165,639,600	247,223,280
Jamaica Plain	3,922,300	5,854,179	12,572,100	18,764,328
Hyde Park	4,389,400	6,551,343	20,288,800	30,281,791

* No 1925 sample for Charlestown; ratio used is total Boston ratio, 1925.